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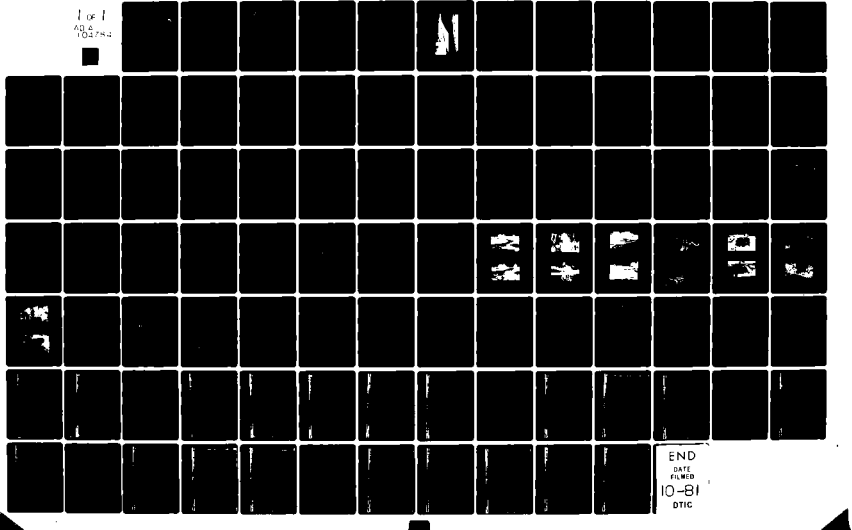

LEVEL II

(1)

MISSISSIPPI - SALT - QUINCY RIVER BASIN

AD A104784

WYACONDA CITY DAM
CLARK COUNTY, MISSOURI
MO 10009

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY: U. S. ARMY ENGINEER DISTRICT, ST. LOUIS

FOR: STATE OF MISSOURI

DECEMBER 1978

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD A104784 / 3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* Phase I Dam Inspection Report National Dam Safety Program Wyaconda City Dam (MO 10009) Clark County, Missouri	5. TYPE OF REPORT & PERIOD COVERED Final Report. / 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Consoer, Townsend and Associates, Ltd.	8. CONTRACT OR GRANT NUMBER(s) DACW43-78-C-0160 ✓
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101	12. REPORT DATE December 1978 / 13. NUMBER OF PAGES Approximately 90
14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)* National Dam Safety Program. Wyaconda City Dam (MO 10009), Mississippi - Salt - Quincy River Basin, Clark County, [redacted] Missouri. Phase I Inspection Report.	15. SECURITY CLASS. *(of this report)* UNCLASSIFIED / 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for release; distribution unlimited.

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Dam Safety, Lake, Dam Inspection, Private Dams

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.

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DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

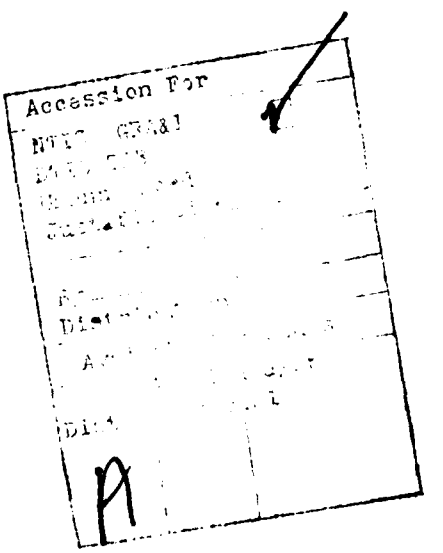
IN REPLY REFER TO

SUBJECT: Wyaconda City Dam (Mo. 10009), Phase I Inspection Report

This report presents the results of field inspection and evaluation of Wyaconda City Dam (Mo. 10009). It was prepared under the National Program of Inspection of Non-Federal Dams.

SUBMITTED BY: SIGNED
Chief, Engineering Division
29 DEC 1978
(Date)

APPROVED BY: SIGNED
Colonel, CE, District Engineer
29 DEC 1978
(Date)



PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Wyaconda City Dam, Missouri Inv. No. 10009
State Located:	Missouri
County Located:	Clark
Stream:	Unnamed Tributary of the South Wyaconda River
Date of Inspection:	September 27 & 28, and October 5, 1978

Wyaconda City Dam No. Mo.10009 was inspected using the "Recommended Guidelines for Safety Inspection of Dams". These guidelines were developed by the Chief of Engineers, U.S. Army, Washington, D.C., with the help of Federal and state agencies, professional engineering organizations, and private engineers. The resulting guidelines are considered to represent a consensus of the engineering profession.

Based on the criteria in the guidelines, the dam is in the high hazard potential classification, which means that loss of life and appreciable property loss could occur in the event of failure of the dam. Three farmhouses, one state highway, and one county road would be subjected to flooding, with possible damage and/or destruction, and possible loss of life. Wyaconda City Dam is in the small size classification since it is less than 40 feet high and impounds less than 1,000 acre-feet of water.

Our inspection and evaluation indicates that the spillway of Wyaconda City Dam does not meet the criteria set forth in the guidelines for a dam having the above size and hazard potential. Wyaconda City Dam is a small size dam with a high hazard

potential required by the guidelines to pass from one-half Probable Maximum Flood to the Probable Maximum Flood without overtopping. Since there is a relatively wide valley and little development downstream of the dam, one-half of the Probable Maximum Flood is the appropriate spillway design flood. It was determined that the spillway will pass 46 percent of the Probable Maximum Flood without overtopping the dam. Also, our evaluation indicates that the spillway will not pass the 100-year flood; that is, a flood having a 1 percent chance of being equalled or exceeded during any given year..

The Probable Maximum Flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in the region.

Other deficiencies noted by the inspection team were a need for an annual inspection by a qualified professional engineer; lack of a maintenance schedule; embankment sloughing and surface erosion on the upstream slope; deteriorated concrete in the concrete spillway chute; a blocked spillway discharge channel with vegetative growth in this channel; cracks along the entire length of the crest of the dam on each side of the new core; a need to assure that the top of the embankment is uniform for its entire length; and a need to uncover the outlet end of the gravity drainline. The lack of stability and seepage analysis on record is also a deficiency that should be corrected.

It is recommended that the owner take action to correct or control the deficiencies described above.

WYACONDA CITY DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Wyaconda City Dam, I.D. No. 10009

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WYACONDA CITY DAM, Missouri Inv. No. 10009

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

The Dam Inspection Act, Public Law 92-367 of August, 1972, authorizes the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspections. Inspection for the Wyaconda City Dam was carried out under Contract DACW 43-78-C-0160 to the Department of the Army, St. Louis District, Corps of Engineers, by the engineering firms of Consoer, Townsend & Associated Ltd., and Engineering Consultants, Inc. (A Joint Venture), of St. Louis, Missouri.

b. Purpose of Inspection

The visual inspection of the Wyaconda City Dam was made on September 27 & 28, and October 5, 1978. The purpose of the inspection was to make a general assessment as to the structural integrity and operational adequacy of the dam embankment and its appurtenant structures.

c. Scope of Report

This report summarizes available pertinent data relating to the project; presents a summary of visual observations made during the field inspection; presents an evaluation of hydrologic and hydraulic conditions at the site; presents an evaluation as to the structural adequacy of the various project features; and assesses the general condition of the dam with respect to safety.

It should be noted that reference in this report to left or right abutments is as viewed looking downstream. Where left abutment or left side of the dam is used in this report, this also refers to north abutment or side, and right to the south abutment or side.

d. Evaluation Criteria

Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief Engineers, in "Recommended Guidelines for Safety Inspection of Dams", Appendix D. These guidelines were developed with the help of several Federal agencies and many state agencies, professional engineering organizations, and private engineers.

1.2 Description of the Project

a. Description of Dam and Appurtenances

Wyaconda City Dam was originally constructed with a 10-foot wide crest, 490 feet long, at an elevation of 690.0 feet above MSL. The upstream embankment slope was 1V to 3H, and the downstream embankment slope was 1V to 2H. A 12-inch thick layer of riprap was placed for a length of 35 feet beginning at the crest and extending down the upstream slope. The embankment was originally constructed of "selected impervious fill" for the upstream two-thirds of the embankment, with "coarser material" placed in the downstream one-third of the embankment.

In 1977, the embankment section was rebuilt. A new 12-foot wide by a maximum of 32 foot deep impervious core was placed in the center of the embankment to reduce seepage through the dam. The dam crest was also raised from elevation 690.0 to elevation 691.29 by the addition of embankment material. However, the elevation of the concrete spillway wall was not raised.

The crest of the embankment is currently 12 feet wide and protected with a thin layer of gravel road base. The upstream slope has a side slope of 1V to 3H, and the riprap was covered during reconstruction. The embankment material is protected by a thin vegetative cover.

The downstream embankment slope is currently 1V to 3-4H. The slope was recently final-graded, and no vegetation was present on the slope.

Bedrock within the vicinity is composed of Mississippian age limestones. No bedrock crops out over the site. The soils of the area in which this dam is located are considered to be mixed glacial outwash modified with loessial deposits further modified by weathering.

A cut-off trench was excavated during the original construction to impervious material or bedrock along the entire length of the embankment. Side slopes of the trench are inclined at 1V to 1H, and the width of the base of the trench is 10 feet.

The spillway is an uncontrolled overflow section which is located at the right abutment. The net spillway crest length is 50 feet. The spillway crest was raised about 2.29 feet in 1977 by adding fill to the spillway approach channel. The spillway crest is at elevation 687.29 feet above MSL. The spillway consists of an earthfilled crest section, a sloping concrete chute and a concrete spillway channel. The spillway channel width narrows from 50 feet at the weir to 25 feet at the end of the channel. Chute walls on both sides of the channel are 5 feet high. There are no energy dissipators of any kind at the end of the spillway channel. The spillway channel connects with an unlined discharge channel.

A pump station vault is situated at the downstream toe of the dam, which supplies raw water through a 4-inch pipe to the treatment facilities of Wyaconda. Raw water from the reservoir reaches the pump vault through a 4-inch iron pipe outlet which passes under the base of the dam embankment.

The 4-inch outlet pipe connects at its upstream end to a length of 4-inch diameter flexible hose fitted with an intake strainer. The strainer is supported below the surface by a galvanized wire rope which is suspended from and passes over a pully sheave to connect to a hand winch mounted on the dam embankment. The pully sheave is supported above the reservoir surface from a timber constructed tripod structure founded on the reservoir bottom. The submergence depth of the intake strainer can be adjusted by the hoist.

In the pump vault, the 4-inch outlet pipe divides to two 4-inch branches: one branch connecting to the suction pipe of the two pumps and the other to a 4-inch drain line leading to the water course below the dam. The drain line is fitted with a gate valve and permits draining the reservoir by gravity flow.

b. Location

The Wyaconda City Dam is located on an unnamed tributary of the South Wyaconda River, Clark County, Missouri. The nearest community downstream of the dam is Medill, which is roughly 9 miles from the lake. The dam and reservoir is shown on the Wyaconda Quadrangle Sheet (7.5 minute series) in Section 33, Township 65 North, Range 9 West.

c. Size Classification

According to the "Recommended Guidelines for Safety Inspection of Dams", by the U.S. Department of the Army, Office of the Chief Engineer, the dam is classified in the dam size category as being "Small" since its storage is less than 1,000 acre-feet. The dam is also classified as "Small" in dam size category because its height is less than 40 feet. The overall size classification is, accordingly, "Small" in size.

d. Hazard Classification

The dam has been classified as having "High" hazard potential in the National Inventory of Dams, on the basis that in the event of failure of the dam or its appurtenances, excessive damage could occur to downstream property, together with the possibility of the loss of life. Our findings concur with the classification. The estimated damage zone extends 1.5 miles downstream of the dam. Within the damage zone are three farmhouses with associated farm buildings, one state highway, and one county road. The floodplain is farmed.

e. Ownership

Wyaconda City Dam is owned by the City of Wyaconda, P.O. Box 68, Wyaconda, Missouri 63474.

f. Purpose of Dam

The purpose of the dam is to impound water for use in a water supply system operated by the City of Wyaconda. The impounded water is released by means of the bottom outlet for subsequent use in the city by way of a pumping station immediately downstream from the dam.

g. Design and Construction History

Wyaconda City Dam was designed by Archer Engineering Company of Kansas City, Missouri. The dam was originally constructed in 1961.

In 1977, the embankment section was rebuilt. A new 12-foot wide by a maximum of 32-foot deep core was placed in the center of the embankment to reduce seepage through the dam. The dam crest was also raised from elevation 690.0 to elevation 691.29 by the addition of embankment material. A 4-inch diameter feeder pipe was also laid from the Wyaconda River to the lake for water supply to the reservoir.

h. Normal Operational Procedures

The dam is used to impound water for water supply for the City of Wyaconda, Missouri. The reservoir level is controlled by rainfall, runoff, evaporation and water supply requirements for the city. The reservoir is likely close to full at all times.

1.3 Pertinent Data

a. Drainage Area — 200 acres

b. Discharge at Damsite — All discharge at the damsite is through an uncontrolled spillway and a water supply outlet

Estimated experienced maximum flood:	370 cfs
Estimated ungated spillway capacity at maximum pool elevation:	1,056 cfs

c. Elevation (Feet above MSL)

Top of Dam:	691.29
Spillway crest:	687.29
Minimum streambed elevation at centerline of dam:	659.29
Maximum tailwater:	Unknown

d. Reservoir

Length of maximum pool:	1,300 feet ±

e. Storage (Acre-Feet)

Top of dam:	72
Spillway crest:	40

f. Reservoir Surface (Acres)

Top of dam:	9
Spillway crest:	7

g. Dam

Type:	Earth embankment
Length:	490 feet
Height (maximum):	32 feet
Top width:	12 feet
Side slopes:	
Upstream	1V to 3-4H
Downstream	1V to 3H
Zoning:	Upstream impervious material, impervious core placed after original construction, and downstream coarse material
Impervious core:	12 feet wide by a maximum of 32 feet deep
Cutoff:	Core trench with 10-foot bottom width and 1V to 1H side slopes
Grout curtain:	None

h. Diversion and Regulating Tunnel — None

i. Spillway

Type:	Uncontrolled
Length of weir:	50 feet
Crest elevation:	687.29

j. Regulating Outlets

Type:	4-inch diameter cast iron pipe
Length:	130 feet
Closure:	4-inch diameter cast iron valves
Maximum Capacity:	0.9 cfs

SECTION 2: ENGINEERING DATA

2.1 Design

Original design drawings are available for the dam and appurtenant structures. Several of these drawings are included as plates in this report. As-built drawings are currently being made for the reconstructed dam, but are not available at this time. No other design data is available.

2.2 Construction

The dam was constructed in 1961. Some reconstruction was performed in 1977, as described earlier in this report. No additional construction data is available.

2.3 Operation

No operation records for Wyaconda City Dam are available.

2.4 Evaluation

a. Availability

The only engineering data available is the original design drawings. No design computations, construction data or operation data is available.

In addition, no pertinent data was available for review on hydrology, spillway capacity, flood routing through the reservoir, outlet capacity, slope stability, seepage analysis or foundation conditions.

b. Adequacy

The design drawings are adequate to aid in evaluating the adequacy of the hydraulic and hydrologic capabilities and stability of the dam for Phase I investigations.

The lack of engineering data other than design drawings did not allow for a definitive review and evaluation. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing and evaluating design, operation, and construction data, but is based primarily on visual inspection with the aid of the available design drawings, past performance history, and sound engineering judment.

Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record.

c. Validity

The dam and appurtenant structures appears to have been constructed in accordance with the available design drawings, however, drawings are not yet available which show the reconstruction performed in 1977.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

A visual inspection of Wyaconda City Dam was made on September 27 & 28, and October 5, 1978. The following persons were present during the inspection:

Name	Affiliation	Discipline
Yin Au-Yeung	Engineering Consultants, Inc.	Project Engineer, Hydraulics and Hydrology
David Bramwell	Engineering Consultants, Inc.	Geology
Jon Diebel	Engineering Consultants, Inc.	Soils
John Ismert	Engineering Consultants, Inc.	Mechanical
Kevin Blume	Consoer, Townsend & Assoc., Ltd.	Civil & Structural

Specific observations are discussed below.

b. Dam

The crest of the dam is protected with a thin layer of gravel base material. A crack could be seen along virtually the entire length of the crest on each side of the new core. The crack was up to 1-inch wide in some places.

The upstream embankment slope is not protected by riprap following the reconstruction. Some sloughing of the embankment material along the high water line was occurring. Also, surface erosion paths on the slope are prevalent.

Neither of these conditions has progressed to a serious degree at this time.

The downstream embankment slope had been recently regraded. This has left the slope with a smooth, well-graded finish, and clear of all vegetation.

The recent reconstruction raised the dam crest 1 to 2 feet from one abutment to the other. However, the left concrete spillway wall was not raised, forcing the crest elevation to taper to the elevation of the spillway wall.

No signs of past or present instability were seen on the embankment or in the foundation at any location. Also, no seepage was observed on the downstream embankment slope or downstream of the toe.

c. Appurtenant Structures

(1) Spillway

The original overflow weir of the spillway crest was raised about 2.29 feet in 1977. The increase in elevation was accomplished by filling up the spillway approach channel to elevation 687.29. This filled section is stable at the time of inspection, but will be eroded away when large floods pass through the section. Concrete in the spillway structure is in poor condition. Vertical cracks in the chute walls, spalling and erosion on the floor slabs, and vegetative growth between horizontal joints are apparent. However, no leakage was observed on the spillway structure at any location.

(2) Outlet Works

The hand winch and the top of the tripod structure in the reservoir were observed and seen to be in good condition. In the pump vault, the piping, pumps and valves were inspected and found to be in good operating condition. The outlet from the 4-inch gravity drain line was not located during the inspection.

d. Reservoir Area

The water level was at 687.29 feet above MSL at the time of the inspection.

Around the reservoir rim are cultivated lands and pasture with few trees. Slopes on the reservoir shore generally are flatter than 1V to 8H. No sign of erosion or slope instability were noted on the shoreline.

e. Downstream Channel

The downstream channel starts at a 90 degree turn at the end of the concrete spillway channel. The channel is well-defined, but with a much smaller cross-sectional area than the spillway channel. The cross-section of the downstream channel is a trapezoidal unlined channel with an average bottom width of 3 feet and side slopes of 1V to 1-1/2H. The channel runs parallel to the dam toe for about 300 feet, then turns 90 degrees into the natural channel.

No signs of erosion or slope sloughing in the discharge channel were observed. Vegetation was seen at the downstream end of the concrete channel and past the 90 degree turn for a distance of approximately 150 feet.

3.2 Evaluation

The visual inspection did not exhibit any items which are sufficiently significant to indicate a need for immediate remedial action.

The following items were observed which could affect the safety of the dam, or which will require maintenance within a reasonable period of time.

1. The cracks along the crest of the dam on each side of the new core.

2. The sloughing and erosion occurring on the upstream embankment slope.

3. Non-uniform elevation of the embankment crest due to the failure to raise the wall of the spillway channel.

4. Poor condition of the concrete in the spillway channel.

5. The material placed in the spillway approach channel to allow a higher water surface elevation in the reservoir.

6. The small spillway discharge channel and the 90 degree bends in the channel. Also, the channel runs parallel to the toe of the embankment for a length of 300 feet.

7. Vegetation was observed in the downstream spillway discharge channel.

8. The outlet end of the drain line appears to be buried.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

Wyaconda City Dam is used to impound water from an unnamed tributary of the South Wyaconda River. The water is then used as water supply for the City of Wyaconda, Missouri.

The only operating facilities at the dam are the water supply intake and piping, which includes a pump vault downstream of the dam.

In the pump vault, the valve in each branch line of the reservoir outlet pipe is manually operated; the valve in the pump suction branch normally being kept open, and the valve in the drain branch normally closed. The drain valve would be opened to draw down the reservoir for any reason.

4.2 Maintenance of Dam

The dam is maintained by the Wyaconda Water Superintendent. Most of the problems observed at the dam involve the concrete spillway and its approach and discharge channels. These observations are discussed in various sections of this report. Maintenance of the dam and appurtenant structures appears to be generally satisfactory.

4.3 Maintenance of Operating Facilities

The operating facilities which could be observed appear to be satisfactorily maintained.

4.4 Description of Any Warning System in Effect

The inspection team is not aware of any existing warning system for this dam.

4.5 Evaluation

The operation procedures and maintenance program appears to be satisfactory at the damsite.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design

The watershed area of Wyaconda Lake consists of about 200 acres, of which approximately 30 percent is covered by forest. Land gradients for the watershed area average about 2 to 2.5 percent. The lake is located on an unnamed tributary of the South Wyaconda River.

Elevations within the watershed range from approximately 685 feet above MSL at the damsite to over 750 feet above MSL in the upper portion of the watershed.

A drainage map showing the watershed area is included in Appendix B.

Evaluation of the hydraulic and hydrologic features of Wyaconda City Dam was based on criteria set forth in the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, and additional guidance provided by the St. Louis District of the Corps of Engineers. The Probable Maximum Flood (PMF) was calculated from the Probable Maximum Precipitation (PMP) using the methods outlined in the U.S. Weather Bureau Publication, Hydrometeorological Report No. 33. The probable maximum storm duration was set at 24 hours, and storm rainfall distribution was based on criteria given in EM 1110-2-1411 (Standard Project Storm). The SCS triangular hydrograph, transformed to a curvilinear hydrograph, was adopted for developing the unit hydrograph. The derived unit hydrograph is presented in Appendix B.

Initial and infiltration loss rates were applied to the PMP to obtain rainfall excesses. The rainfall excesses were then applied to the unit hydrograph to obtain the PMF hydrograph, utilizing the Corps of Engineers' computer program HEC-1, (Dam Safety Version), which was prepared specifically for dam safety analysis. The computed peak discharge of the PMF and one-half of the PMF are 4,505 cfs and 2,253 cfs, respectively.

Both the PMF and one-half of the PMF inflow hydrographs were routed through the reservoir by the Modified Puls Method, also utilizing the HEC-1 (Dam Safety Version) computer program. The peak outflow discharges for the PMF and one-half of the PMF are 3,751 cfs and 1,256 cfs, respectively. Both the PMF and one-half of the PMF, when routed through the reservoir, resulted in overtopping of the dam. The hydraulic capacity of the spillway is 1,056 cfs when water level is at the top of the dam.

The stage-outflow relation for the spillway was prepared from field notes, sketches and limited construction drawings. The reservoir stage-capacity data were based on the U.S.G.S. Wyaconda Quadrangle topographic maps (7.5 minute series, dated 1951) in combination with data given in the National Dam Safety Inventory Table. Reservoir storage capacity included surcharge levels exceeding the top of the dam, and the spillway rating curve assumed that the dam remains intact during routing. In the routing computations, the discharge through the outlet facilities was excluded due to its insignificant magnitude as compared to the spillway discharge and the PMF. The spillway rating curve and the reservoir capacity curve are also presented in Appendix B.

From the standpoint of dam safety, the hydrologic design of a dam aims at avoiding overtopping. Overtopping is especially dangerous for an earth dam because the downrush of waters over the crest will erode the dam face and, if continued long enough, will breach the dam embankment and release all the stored water suddenly into the downstream floodplain. The safe hydrologic design of a dam calls for a spillway discharge capability, in combination with an embankment crest height that can handle a very large and exceedingly rare flood without overtopping.

b. Experience Data

No records of reservoir stage or spillway discharge are maintained for this site. However, according to the owner, the maximum reservoir level was never higher than the crest of the embankment.

c. Visual Observations

The spillway structure is well-defined, but lacks proper maintenance. The filled approach channel section, without adequate protection, is vulnerable to erosion from overflows. Concrete in the spillway structure is in poor condition. There were signs of vertical cracks on the chute walls, vegetation growth in between the joints, and general spalling and erosion in concrete. Minor settlements were noted on the concrete channel floor slabs. Several reinforcing bars are exposed at floor slabs at the end of the concrete channel. The downstream channel has a cross-sectional area which is much smaller than the spillway channel, has two 90 degree bends before reaching the natural channel, and contains vegetation, restricting flow.

d. Overtopping Potential

As indicated in Section 5.1-a., both the Probable Maximum Flood and one-half of the Probable Maximum Flood, when routed through the reservoir, result in overtopping of the dam. The PMF and one-half of the PMF overtopped the dam crest by 1.34 feet and 0.13 feet, respectively. The total duration of embankment overflow is 0.58 hours during the PMF, and 0.25 hours during one-half of the PMF. The spillway of the Wyaconda City Lake Dam is capable of passing a flood equal to approximately 46 percent of the PMF just before overtopping the dam. The 100 year flood is equal to approximately 7 percent of the PMF, therefore, the spillway will pass the 100-year flood without overtopping of the dam.

Wyaconda City Lake Dam is a small size dam with a high hazard potential required by the guidelines to pass from one-half Probable Maximum Flood to the Probable Maximum Flood without overtopping. Since there is a relative wide valley and little development downstream of the dam, one-half of the Probable Maximum Flood is the appropriate spillway design flood for this dam.

The effect from rupture of the dam could extend approximately 1.5 miles downstream of the dam. There are three farmhouses, one state highway, and one county road within the four miles of the floodplain area. The floodplain is extensively farmed.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

There were no signs of settlement or distress observed on the embankment or foundation during the visual inspection. The upstream slope, crest, and downstream slope demonstrated some sloughing and surface erosion due to the lack of riprap, but the condition has not progressed to a serious degree at time. Cracks were observed along the crest on either side of the new core, and is a condition which should be repaired. The downstream embankment slope is in excellent condition.

The crest should have a uniform elevation due to the potential of overtopping. Overtopping on a non-uniform crest causes concentration of flows which serve to more rapidly erode the embankment materials.

There were signs of settlement on the spillway floor slabs. Moderate spalling and erosion of concrete in the entire spillway structure, especially at end sections, were apparent. Reinforcing bars are exposed in the air at the end slabs, with some holes existing in the slab at this area. Vegetation is growing between horizontal joints. All these deficiencies will, in time, adversely affect the structural stability of the spillway structure, and should be corrected. The downstream channel, if not enlarged, would be inadequate to pass the spillway discharge without encroaching into the downstream toe of the dam. The 90 degree bends would not

adequately direct the discharge flows even if the channel was of sufficient size to handle the discharge quantity.

No problems were observed with the outlet works which will jeopardize the safety of the dam. However, the drain line was apparently covered during the recent grading, and should be uncovered.

b. Design and Construction Data

No design or construction data relating to the structural stability of the dam were found. No design data relating to seepage and stability analysis are known to exist.

c. Operating Records

No operating records are available relating to the stability of the dam or appurtenant structures. Water levels have not been recorded, however, it is assumed that the dam is kept near full at all times.

d. Post Construction Changes

The following post construction changes were made which will affect the structural stability of the dam and appurtenant structures.

1. A new impervious core was constructed in the center of the embankment section in 1977 to reduce or eliminate seepage that was occurring through the dam.

2. The dam crest was raised 1.29 feet to allow additional storage capacity, and a 2.29 foot high berm of material placed above the spillway crest to permit the water to be raised without flowing over the spillway.

3. A 4-inch diameter feeder pipe was laid from Wyaconda River to the reservoir.

e. Seismic Stability

In general, projects located in Seismic Zones 0, 1 and 2 may be assumed to present no hazard from earthquake, provided the static stability conditions are satisfactory and conventional margins of safety exist. Wyaconda City Dam is located in Seismic Zone 1. A detailed seismic analysis is not felt to be necessary for this embankment.

SECTION 7: ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment

The assessment of the general condition of the dam is based upon available data and visual observations. Detailed investigations, testing and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

It should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection, along with data available to the inspection team.

It is also important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that an unsafe condition could be detected.

a. Safety

The spillway capacity was found to be "inadequate". The spillway of Wyaconda City Dam will pass 46 percent of the PMF.

The spillway discharge channel is also a problem which should be remedied. The channel is blocked at the downstream end of the concrete chute by the natural terrain, and must make a 90 degree turn along the downstream toe of the

embankment for a distance of 300 feet. After this 300 feet, the flow must again turn 90 degrees into the natural channel. The discharge flowing parallel to the embankment section at the toe will cause substantial undermining at the toe. Also, the 90 degree turns will restrict flow sufficiently to cause water to back up onto the downstream slope, causing saturation of the slope during flood condition.

Several other items were observed during the visual inspection which should be repaired within a reasonable period of time. These include:

1. The sloughing and erosion on the upstream embankment slope due to the lack of riprap.

2. The deteriorated condition of the concrete in the concrete spillway discharge channel.

3. The vegetation observed in the downstream spillway discharge channel.

4. The buried outlet end of the drain line.

5. The crack on the crest of the dam on either side of the new core.

b. Adequacy of Information

Information concerning operation and maintenance of the dam and appurtenant structures is somewhat lacking. It is recommended that the following programs be initiated to help alleviate this problem:

1. Annual inspection of the dam by a professional engineer experienced in the design and construction of earthen dams should be made and this inspection report made a matter of record.

2. Set up a maintenance schedule and log all visits to the dam for operation, repairs and maintenance.

3. Perform seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams".

The design drawings, together with performance history and the visual inspection findings are felt to be adequate information to support the conclusions presented in this report.

c. Urgency

The remedial measures recommended in Paragraph 7.2 should be accomplished within a reasonable period of time. Improvements to the dam crest and the spillway discharge channel are more urgent than the other remedial measures.

d. Necessity for Phase II Investigation

Based on results of the Phase I inspection, a Phase II inspection is not felt to be necessary.

7.2 Remedial Measures

a. Spillway capacity and/or height of dam should be increased to pass one-half of the PMF without overtopping.

b. The spillway discharge channel blockage should be remedied.

c. The cracking along the crest of the embankment should be corrected to prevent surface waters from entering the embankment.

d. The top of the dam should be brought to a uniform elevation to prevent concentration of flows next to the spillway from eroding the sloping top of the dam.

e. An engineer experienced in the design and construction of dams should be retained to determine the best solution to the above problems.

f. O & M Maintenance Procedures: The owner should initiate the following programs:

1. Annual inspection of the dam by a professional engineer experienced in the design and construction of earthen dams.

2. Set up a maintenance schedule and log all visits to the dam for operation, repairs and maintenance.

3. Continually watch the upstream embankment slope for embankment sloughing and surface erosion, and add riprap, as required, to protect the slope.

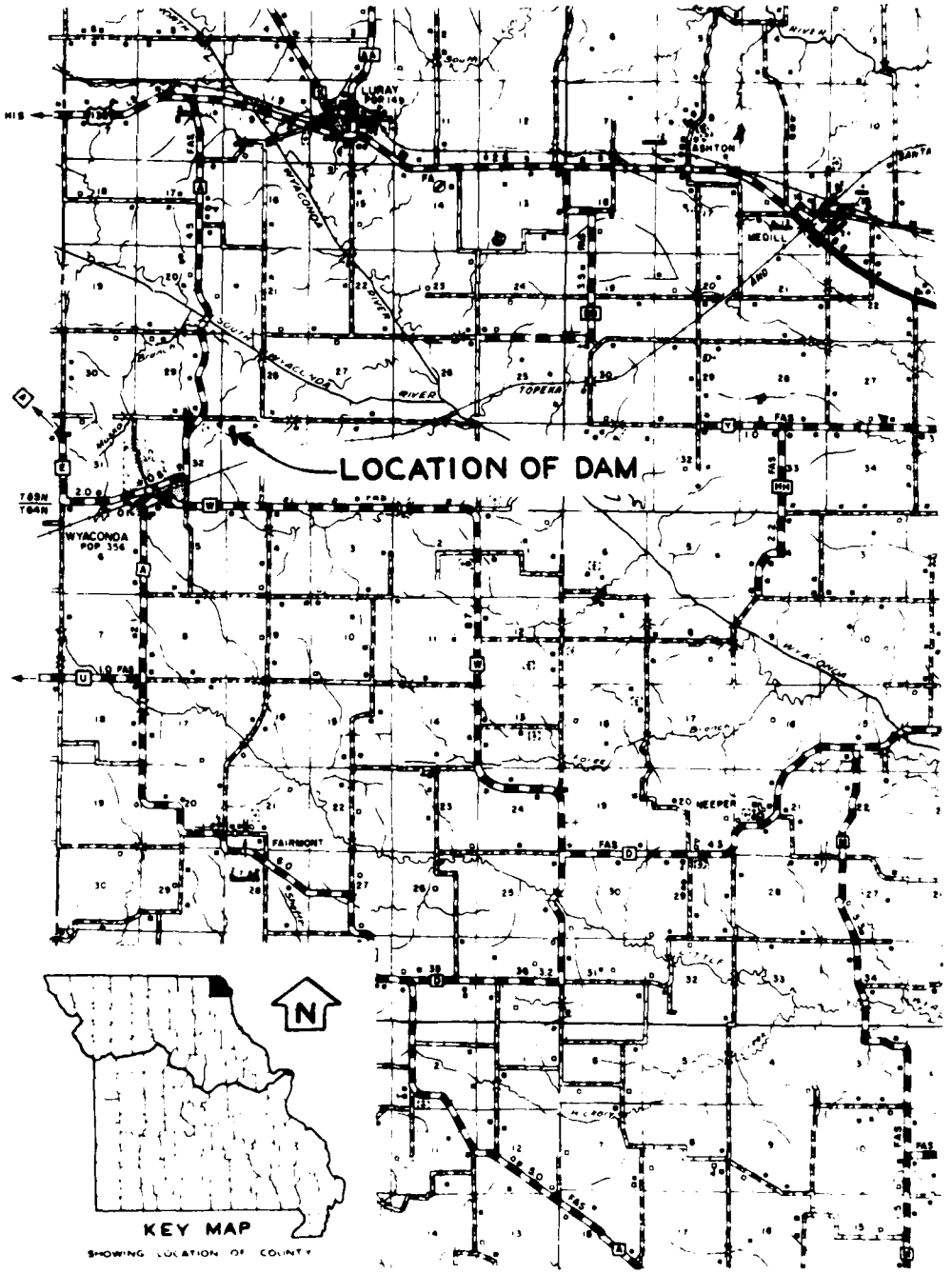
4. Repair the deteriorated concrete in the concrete spillway chute.

5. Remove vegetation in the present spillway discharge channel.

6. Uncover the outlet end of the drain line.

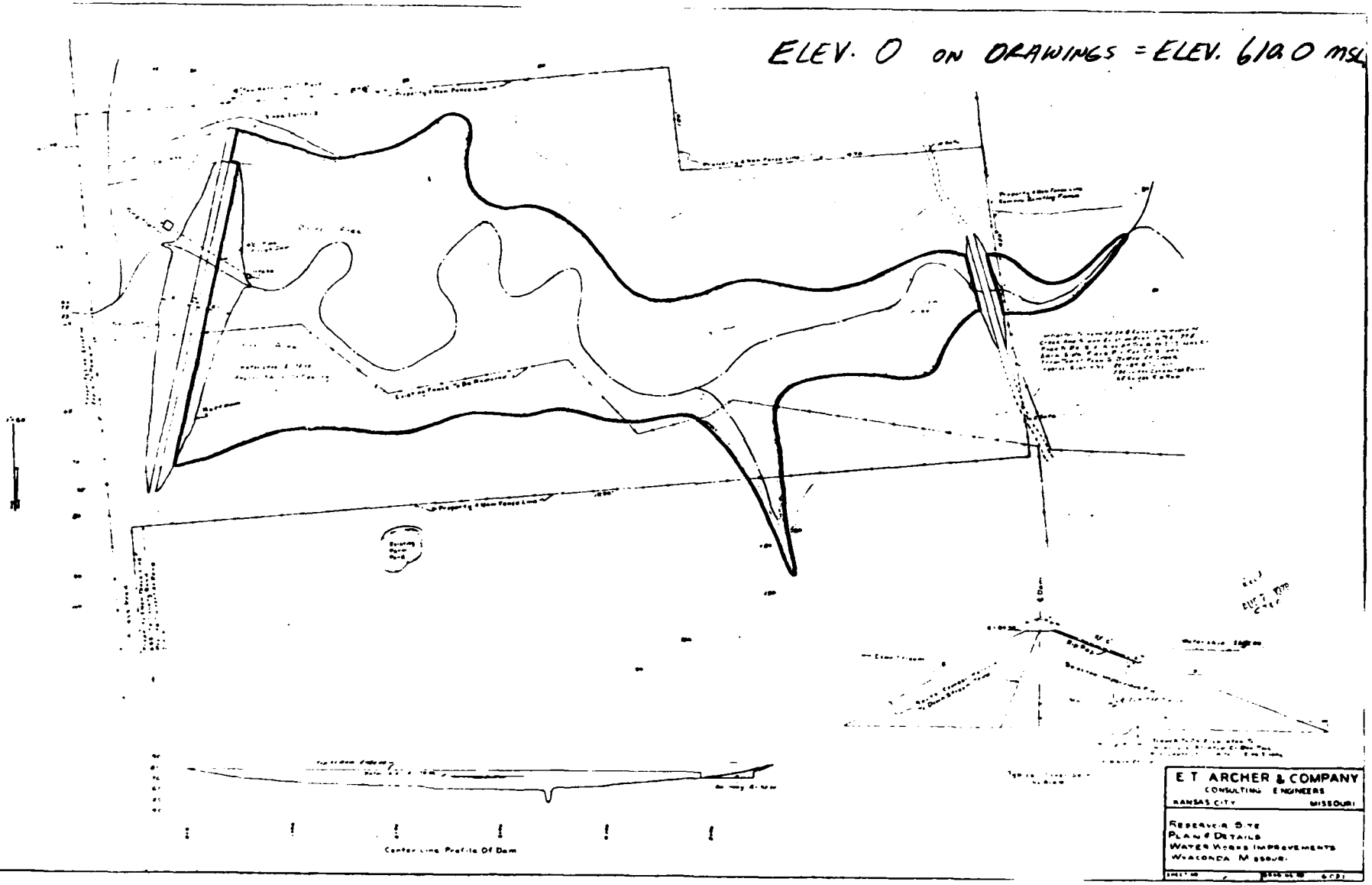
7. Seepage and stability analyses should be performed by a professional engineer experienced in the design and construction of dams.

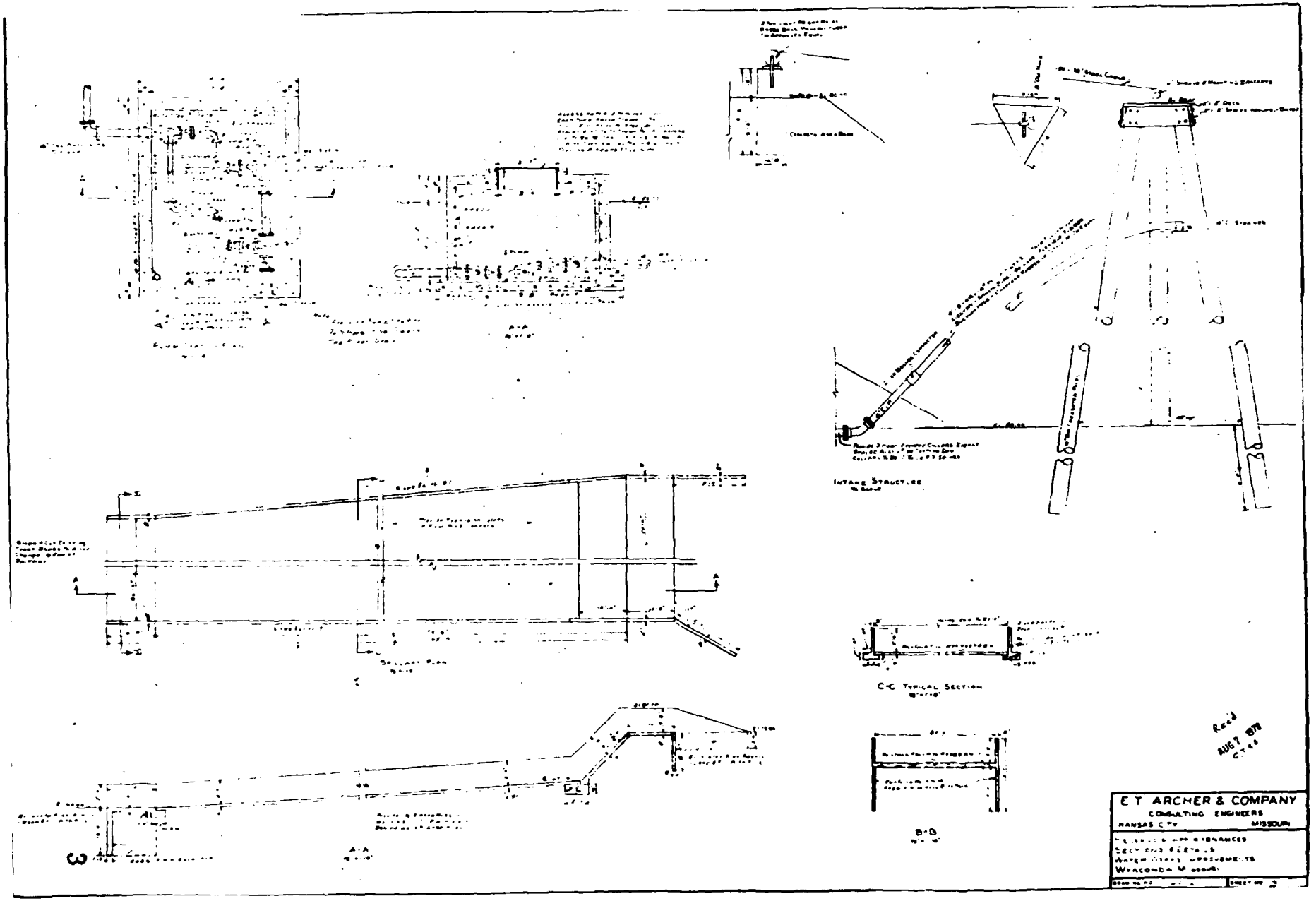
PLATES



LOCATION MAP
WYACONDA CITY DAM
CLARK COUNTY, MISSOURI

ELEV. 0 ON DRAWINGS = ELEV. 619.0 MSL



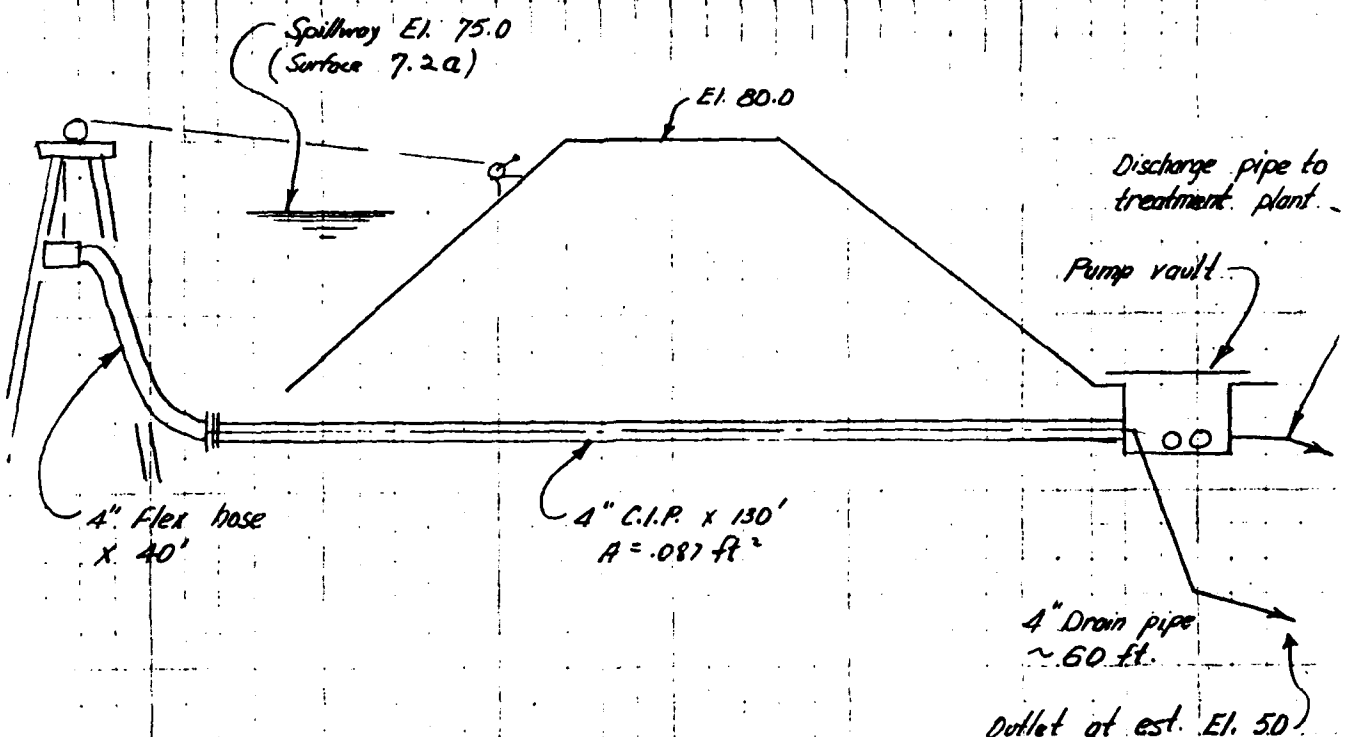

INTAKE STRUCTURE
C-C TYPICAL SECTION
B-B
A-A
Rec'd
AUG 7 1978
E T ARCHER & COMPANY
CONSULTING ENGINEERS
KANSAS CITY
MISSOURI
WYACONDA
3

ECI-4 ENGINEERING CONSULTANTS, INC.

WYACONDA - MISSOURI SHEET NO. 1 OF

JOB NO. 1223

RATING CURVE FOR DRAIN OUTLET BY JCE DATE 10/24/78



Determine overall flow coefficient

Pipe friction

From Hyd. Institute Tables $F \cong 6.6$ where $h_f = F \frac{v^2}{2g}$ per 100'

Increase friction about 15% for ageing $F = 1.15 \times 6.6 \times \frac{230}{100} = 17.5$

$h_f = 17.5 \frac{v^2}{2g}$

Intake loss - assume $0.5\ v^2/2g$

Total

$17.5\ v^2/2g$	Friction
0.5	Entrance
1.0	Exit
$19.0\ v^2/2g$	

$H_{orifice} = 19.0\, v^2/2g = \frac{19\,Q^2}{A^2(2g)} = \frac{19\,Q^2}{(.087)^2(2g)}$

$Q = .087\sqrt{\frac{2gH}{19}} = .16\sqrt{H}$

EL. FT	H-FT	Q-CFS	Q-GPM
55	5	.36	162
60	10	.51	230
65	15	.62	279
70	20	.72	324
75	25	.80	360
80	30	.88	396

Drawdown rate at design pool elevation

Surface area = 7.2 a.

time to drawdown one foot

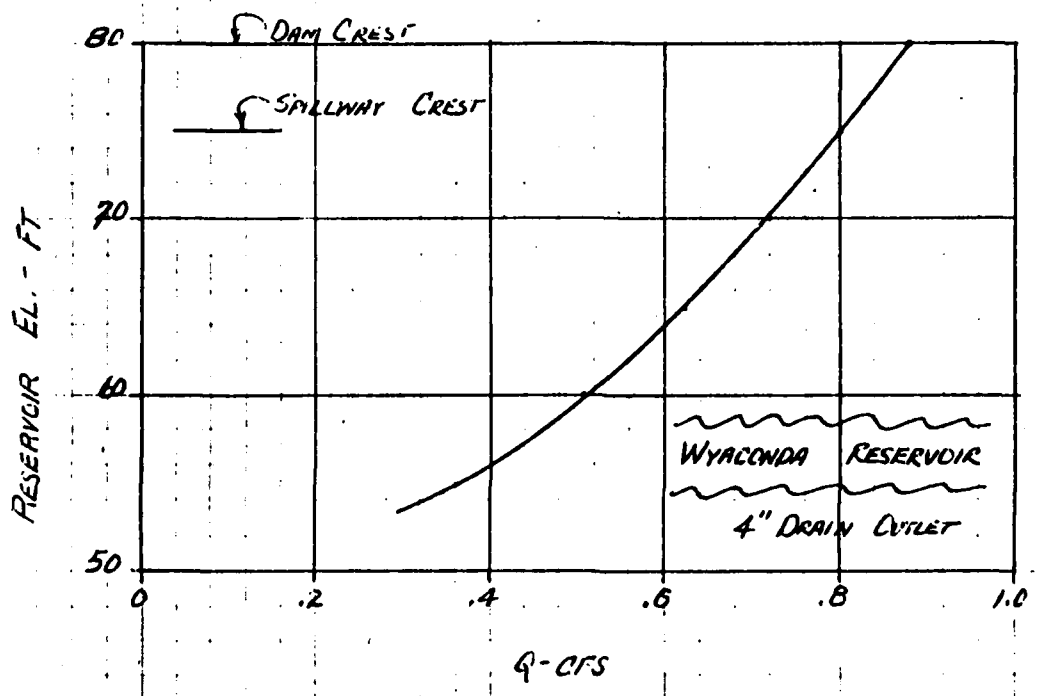
$= \frac{7.2\ a\ (43560\ ft^2/a)}{.80\ ft^3/s\ (60)(60)(24)} = 4.5$ days

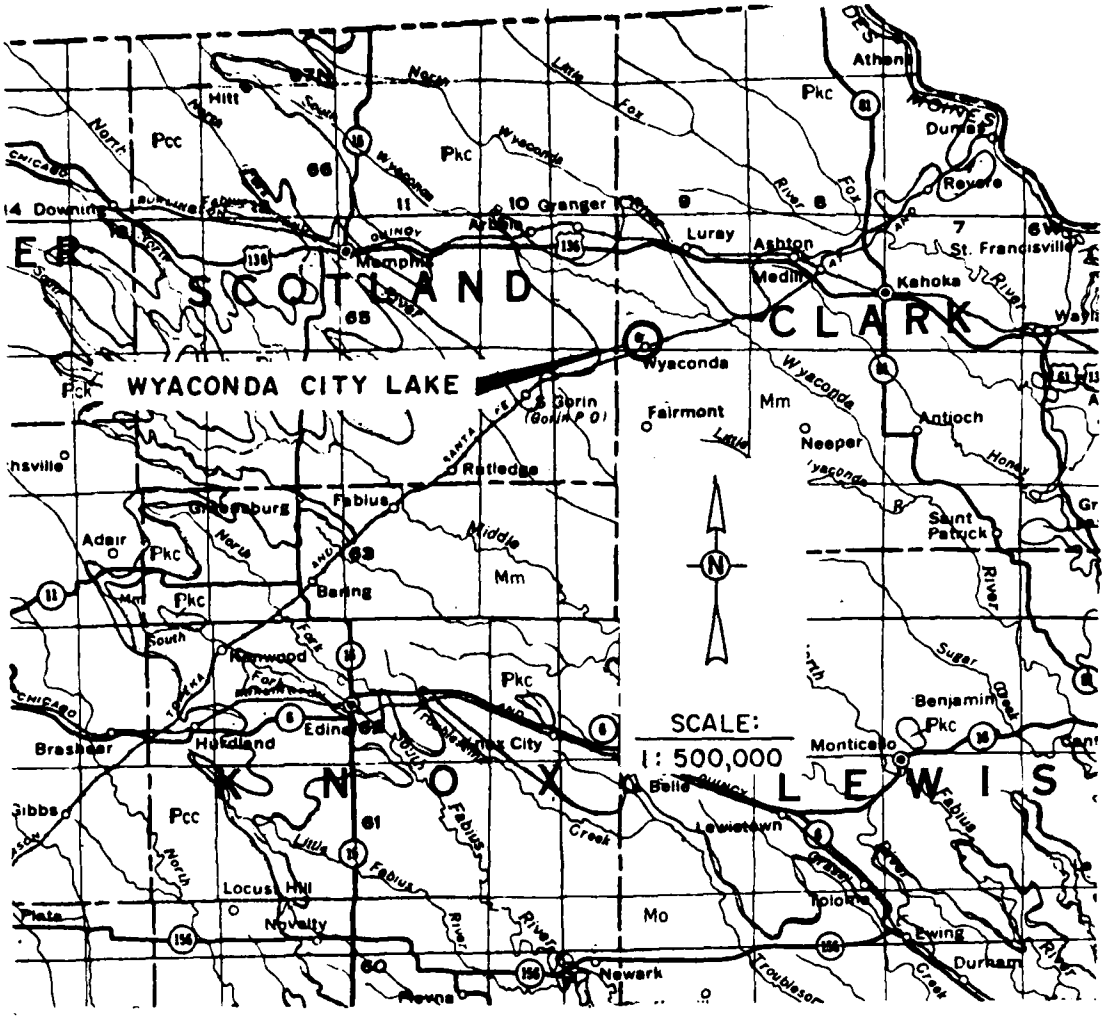
ENGINEERING CONSULTANTS, INC.

WYACONDA - MISSOURI — SHEET NO. 3 OF

JOB NO. 1223

RATING CURVE FOR DRAIN OUTLET — BY JCE DATE 10/26/78





Explanation

Pennsylvanian System

P_{kc} - Kansas City group: cyclic deposits with numerous limestones.
P_{pwm} - Pleasanton group: sandstone channel member.
P_{m} - Marmaton group: cyclic deposits with limestones.
P_{cc} - Cherokee group: cyclic deposits, predominately shale, sandstone and coal beds.

Mississippian System

M_{m} - sandy, oolitic, fossiliferous, lithographic, or cherty limestones.
M_{o} - cherty, crinoidal limestone, with some shale.
M_{k} - intercalated limestones and shales.

Reference: Geologic Map of Missouri, 1961, Division of Geological Survey and Water Resources, State of Missouri.

APPENDIX A

PHOTOGRAPHS TAKEN DURING INSPECTION

WYACONDA CITY DAM

Photo 1 - View across spillway and along crest taken at right abutment.

Photo 2 - View along upstream slope of embankment taken at spillway crest.

Photo 3 - Close-up of sloughing occurring on the upstream slope.

Photo 4 - Close-up of surface runoff erosion occurring on upstream embankment slope.

Photo 5 - View along downstream slope of embankment taken at left abutment.

Photo 6 - Picture of downstream slope of embankment taken downstream of the dam.

Photo 7 - Close-up of cracking near downstream edge of crest.

Photo 8 - Picture of hoist arrangement for the water supply intake.

Photo 9 - Picture of emergency spillway taken from downstream.

Photo 10 - Picture of emergency spillway and downstream channel taken from approach channel.

Photo 11 - Picture of spillway crest taken from right abutment.

Photo 12 - Close-up of concrete erosion and subsequent hole near discharge end of channel.

Photo 13 - View of downstream discharge channel for spillway. See Photo 4 for "approach channel" to downstream.

Photo 14 - Picture of 4-inch I.D. steel pipe intake for pumped water from nearby creek.

Photo 1 - View across spillway and along crest taken at right abutment.

Photo 2 - View along upstream slope of embankment taken at spillway crest.

Photo 3 - Close-up of sloughing occurring on the upstream slope.

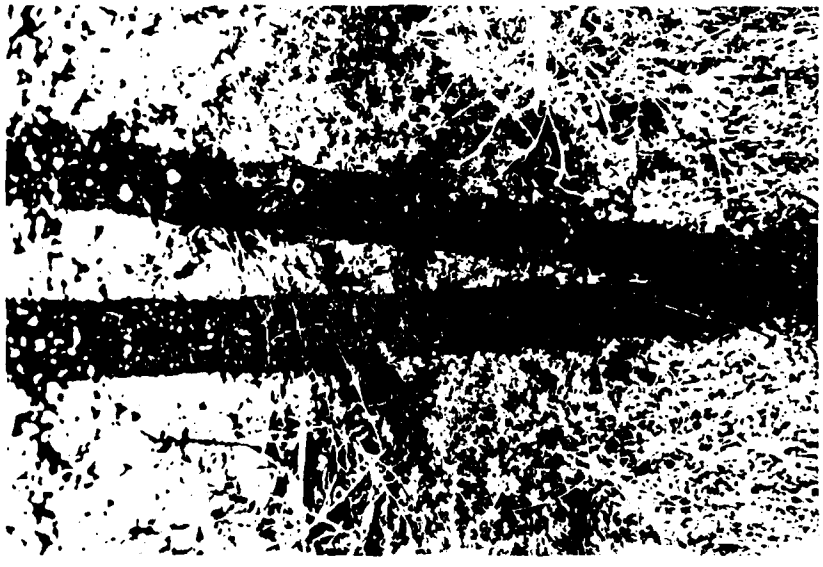


Photo 4 - Close-up of surface runoff erosion occurring on upstream embankment slope.

Photo 5 - View along downstream slope of embankment taken at left abutment.

Photo 6 - Picture of downstream slope of embankment taken downstream of the dam.

Photo 7 - Close-up of cracking near downstream edge of crest.

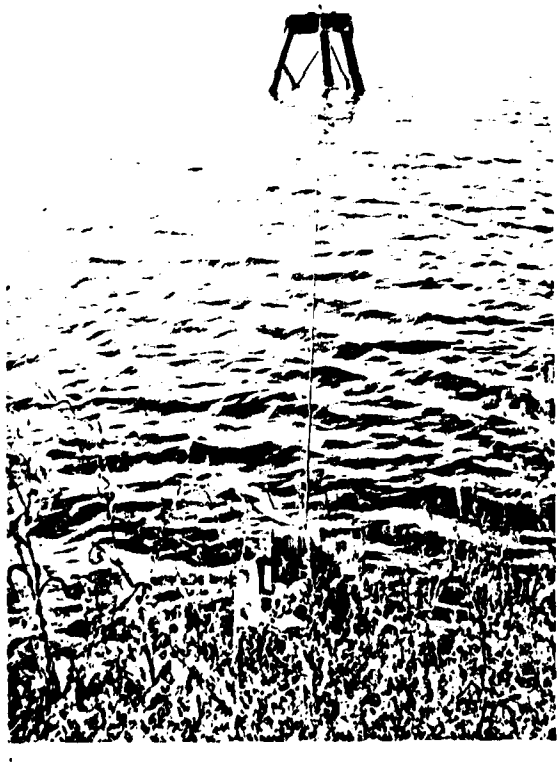


Photo 8 - Picture of hoist arrangement for the water supply intake.

Photo 9 - Picture of emergency spillway taken from downstream.

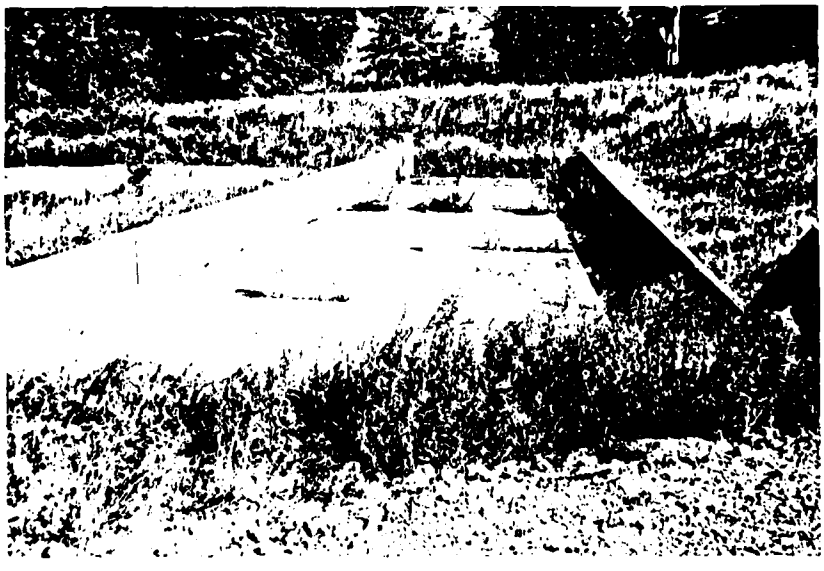


Photo 10 - Picture of emergency spillway and downstream channel taken from approach channel.

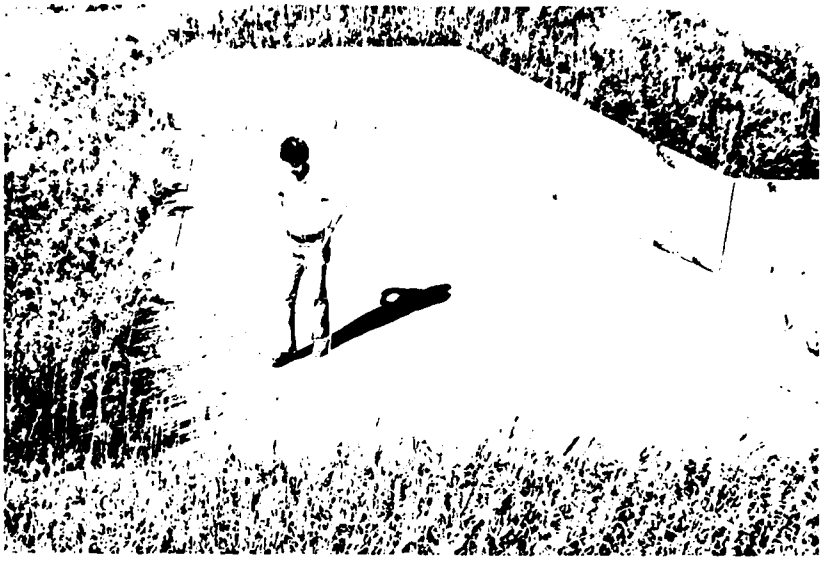


Photo 11 - Picture of spillway crest taken from right abutment.

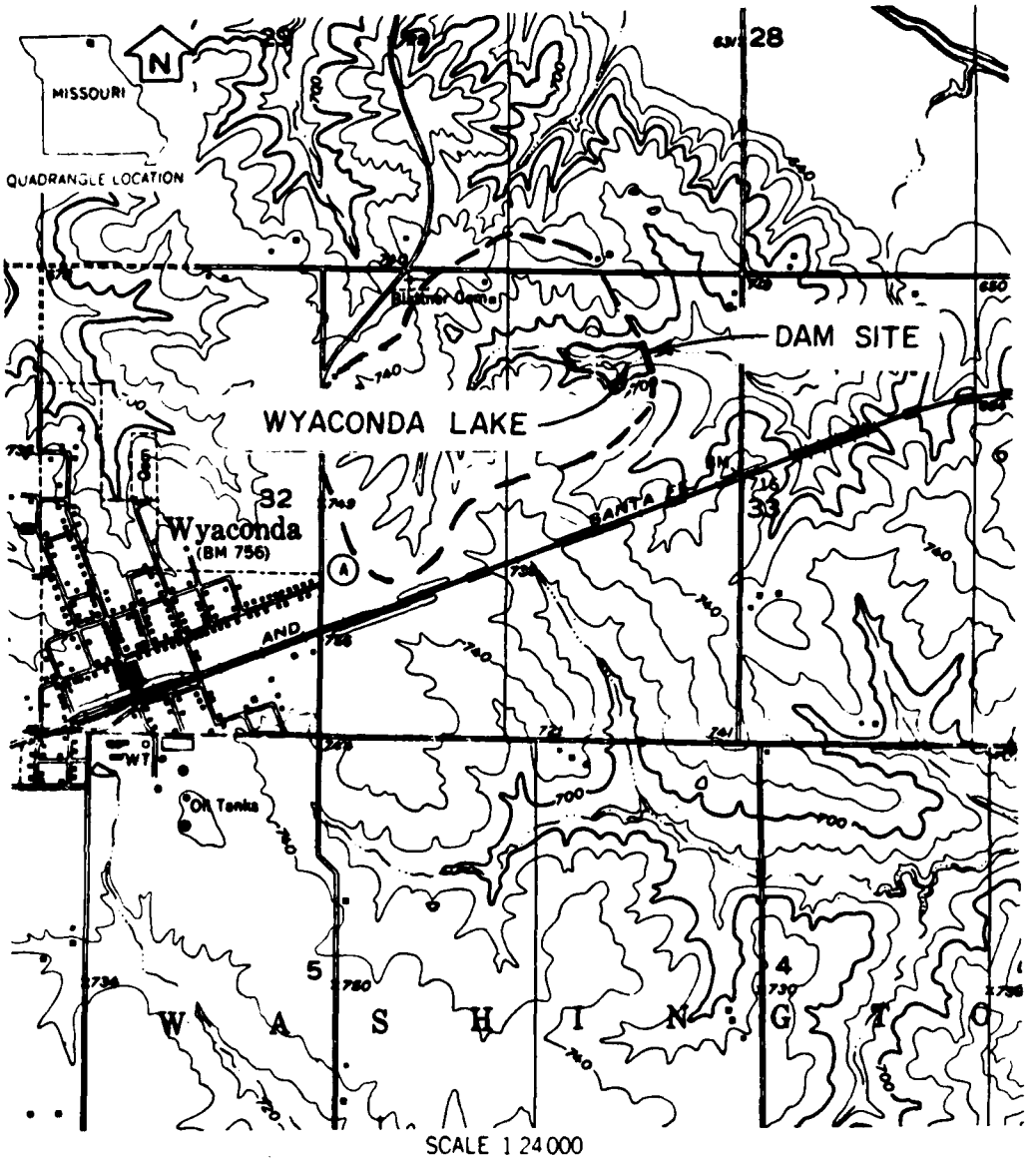
Photo 12 - Close-up of concrete erosion and subsequent hole near discharge end of channel.

Photo 13 - View of downstream discharge channel for spillway. See Photo 4 for "approach channel" to downstream.

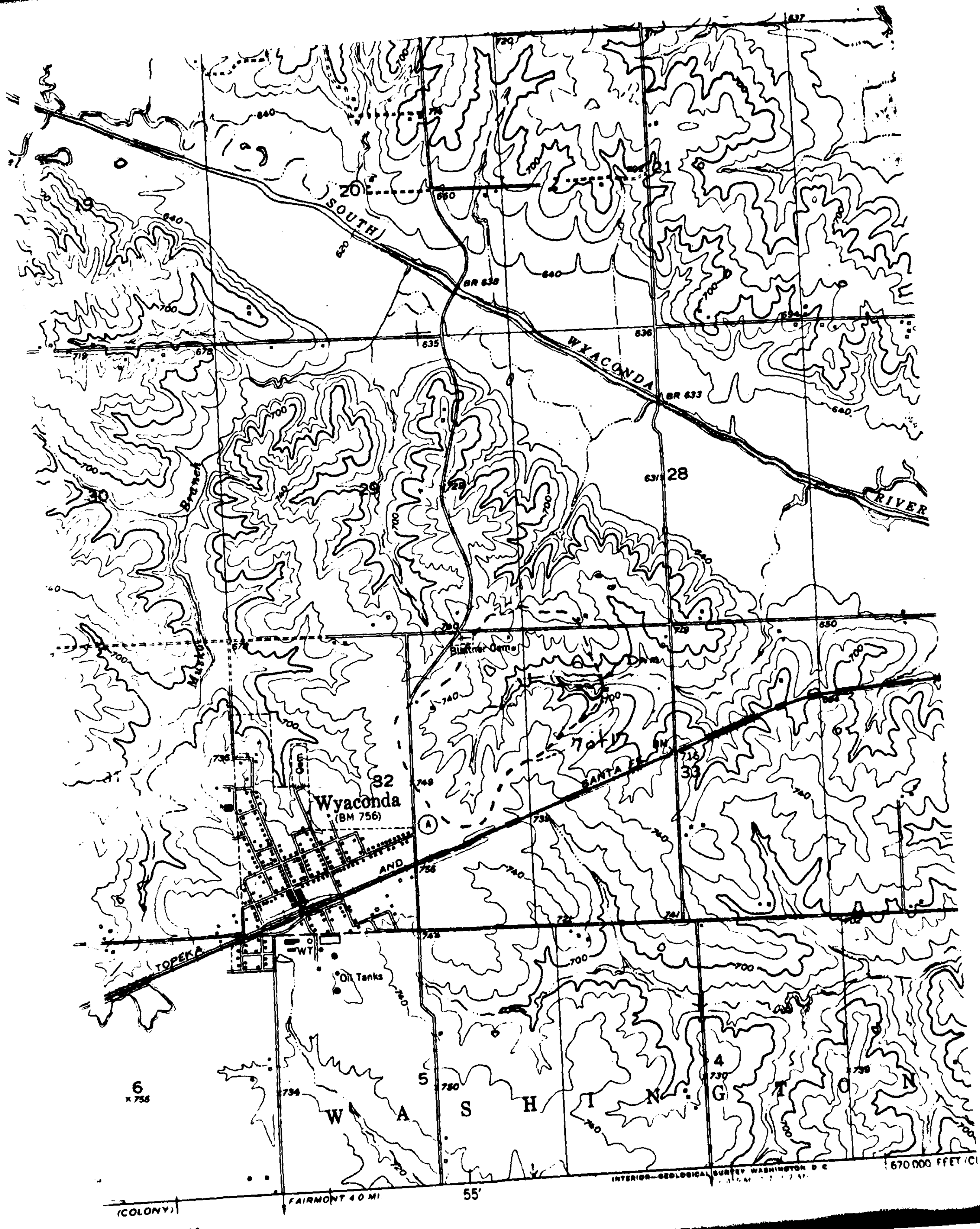
Photo 14 - Picture of 4-inch I.D. steel pipe intake for pumped water from nearby creek.

APPENDIX B

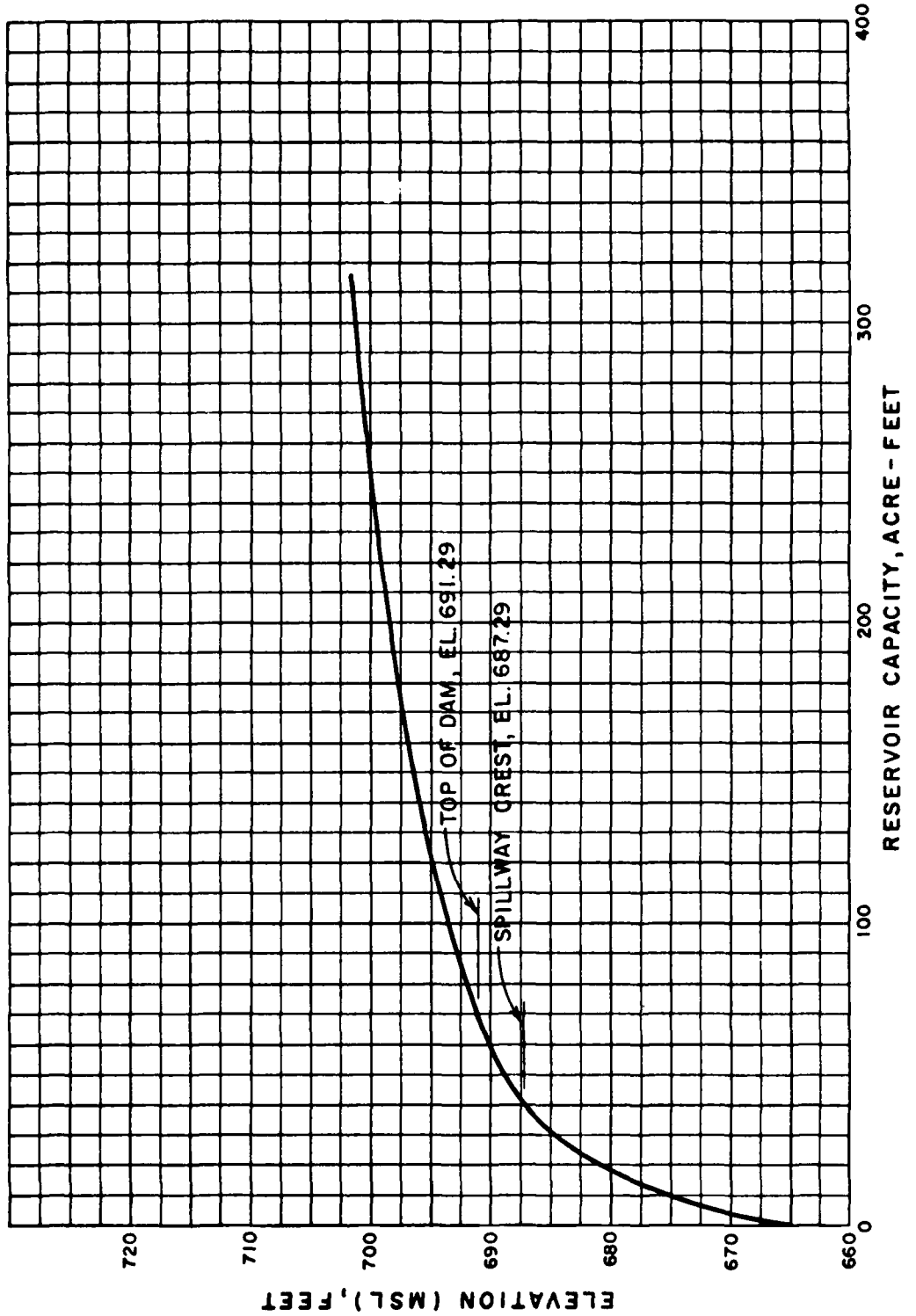
HYDROLOGIC COMPUTATIONS



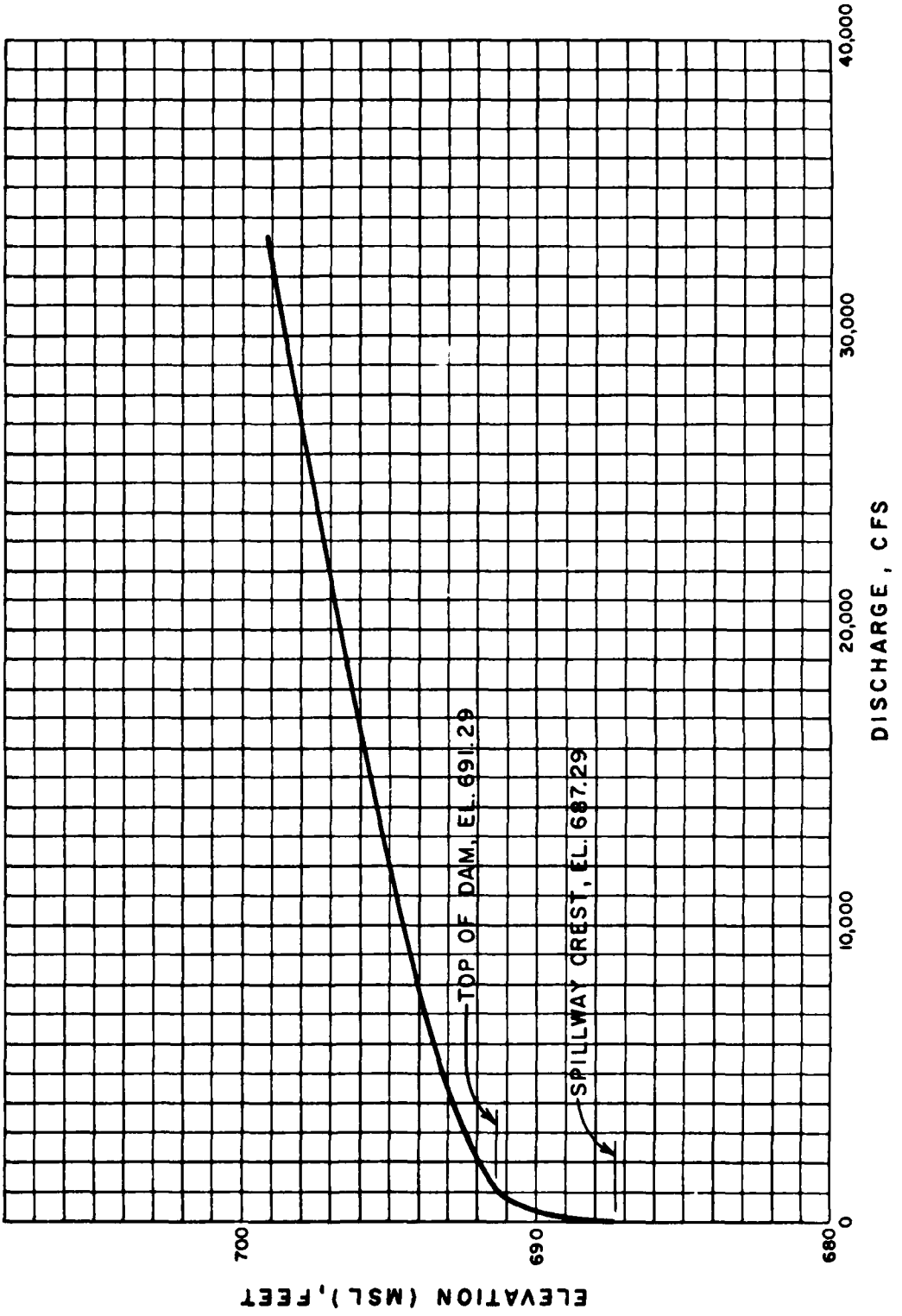
WYACONDA CITY DAM
DRAINAGE AREA



SOUTH
WYACONDA
RIVER
Wyaconda
(BM 756)
Branch
Dam
TOPEKA
AND
SANTA FE
Oil Tanks
WT
W A S H I N G T O N
FAIRMONT 4.0 MI
(COLONY)
55'
INTERIOR—GEOLOGICAL SURVEY WASHINGTON D C



WYACONDA CITY DAM
RESERVOIR CAPACITY CURVE



WYACONDA CITY DAM
SPILLWAY AND OVERTOP RATING CURVE

DAM SAFETY INSPECTION - MISSOURI
WYACONDA CITY DAM
RESERVOIR AREA CAPACITY

SHEET NO. 1 OF
JOB NO. 1223-001-1
BY KLB DATE 10-13-78

WYACONDA LAKE DAM

RESERVOIR AREA CAPACITY

Data are based on USGS Wyaconda Quadrangle Sheet (7.5 Minute Series) in combination with data given in the National Dam Safety Inventory Table.

ELEV (FT) M.S.L.	RESERVOIR SURFACE AREA (ACRES)	INCREMENTAL VOLUME (AC-FT)	TOTAL VOLUME (AC-FT)	REMARKS
665	0	-	0	STREAM BED AT CENTER OF DAM (LOCAL ELEV 50 = MSL ELEV 665)
687.29	7.7	40.0	40.0	SPILLWAY CREST (NORMAL STORAGE RATE FROM INVENTORY.)
691.29	9.0	32.4	72.4	TOP OF DAM
700	21.1	183.8	256.2	AREA MEASURED ON U.S.G.S. QUAD MAP

DAM SAFETY INSPECTION - MISSOURI

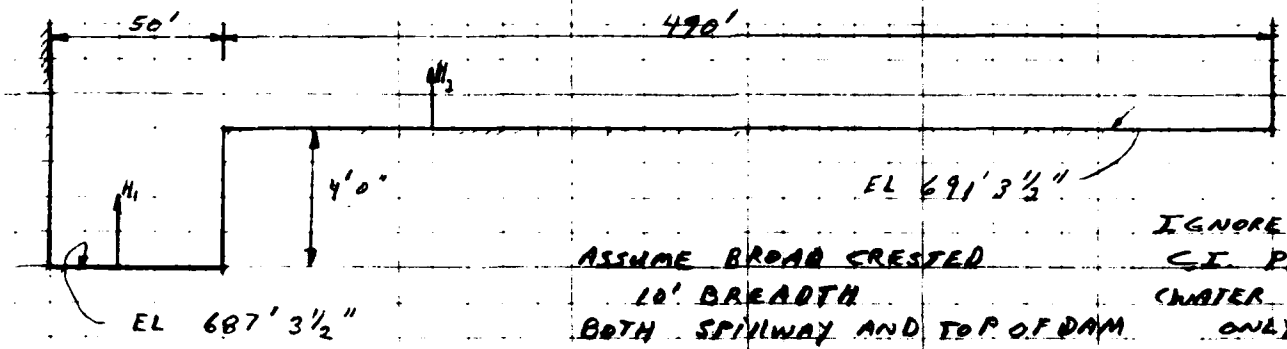
WYACONDA CITY DAM

SPILLWAY AND OVERFLOW DISCHARGE CAPACITY

SHEET NO. 1 OF

JOB NO. 1223-001-1

BY KLB DATE 10-13-78



ASSUME BROAD CRESTED
10' BREADTH
BOTH SPILLWAY AND TOP OF DAM

IGNORE 4" C.I. PIPE (WATER SUPPLY ONLY)

ELEV (FT)	H_1 (FT)	H_2	L_1	L_2	C_1	C_2	$Q = \sum_{i=1}^{2} C_i L_i H_i^{3/2}$
687' 3½"	0	–	50'		–		0
688' 3½"	1	–	50'		2.68		134.
689' 3½"	2	–	50'		2.64		373.
690' 3½"	3	–	50'		2.64		686.
691' 3½"	4	0	50'	490'	2.64	–	1056.
692' 0"	4.71	0.71	50'	490'	2.64	2.68	2135.
693' 0"	5.71	1.71	50'	490'	2.64	2.64	4674.
694' 0"	6.71	2.71	50'	490'	2.64	2.64	8065
695' 0"	7.71	3.71	50'	490'	2.64	2.64	12070
696' 0"	8.71	4.71	50'	490'	2.64	2.64	16.616
698' 0"	10.71	6.71	50'	490'	2.64	2.64	27 111
700' 0"	12.71	8.71	50"	490'	2.64	2.64	39 234

DAM SAFETY INSPECTION - MISSOURI — SHEET NO. 1 OF

WYACONDA CITY DAM — JOB NO. 1223-001-1

UNIT HYDROGRAPH PARAMETERS — BY KLB — DATE 10-9-78

1. DRAINAGE AREA = 200 Ac = 0.31 SQ. MI

2. LENGTH OF STREAM IN AREA = L = (1.9" x 3000'/5280') = 0.22

3. DIFFERENCE IN ELEVATION: ΔH

$\Delta H = 750 - 685 = 65'$

4. TIME OF CONCENTRATION

$$T_c = \left(\frac{11.9 \times L^3}{\Delta H}\right)^{0.385} = \left(\frac{11.9 \times 0.31^3}{65}\right)^{0.385}$$

$T_c = 0.13$ HR.

5. LAG TIME $L_t = 0.6 \times T_c$

$L_t = 0.6 \times 0.13 = 0.08$ HR.

6. UNIT DURATION

$D = \frac{L_t}{3} = 0.04$ HR.

USE $D = 5$ MIN $= 0.083$ HR

(MINIMUM DURATION CRITERIA)

7. TIME T_p PEAK

$T_p = \frac{D}{2} + 0.6 \times T_c$

$T_p = \frac{0.083}{2} + 0.6 \times 0.13$

$T_p = 0.12$ HR.

8. $q_p = \frac{484 \times A}{T_p} = \frac{484 \times 0.31}{0.12} = 1250.33$ CFS

ECI-4

DAM SAFETY INSPECTION - MISSOURI — SHEET NO. 2 OF ____

WYACONDA CITY DAM — JOB NO. 1223-001

UNIT HYDROGRAPH DERIVATION — BY KLB DATE 10-9-78

9) CURVILINEAR UNIT HYDROGRAPH

TIME T/Tp	DISCHARGE RATIO Q/Qp	UNIT HYDROGRAPH TIME, T (HOURS)	UNIT HYDROGRAPH DISCHARGE (CFS)
0.00	0.000	0.00	0.00
0.1	0.015	0.01	18.75
0.2	0.075	0.02	93.77
0.3	0.16	0.04	200.05
0.4	0.28	0.05	350.09
0.5	0.45	0.06	562.65
0.6	0.60	0.07	750.20
0.7	0.77	0.08	962.75
0.8	0.89	0.10	1112.79
0.9	0.97	0.11	1212.82
1.0	1.00	0.12	1250.33
1.1	0.98	0.13	1225.32
1.2	0.92	0.14	1150.30
1.3	0.84	0.16	1050.28
1.4	0.75	0.17	937.75
1.5	0.66	0.18	825.22
1.6	0.56	0.19	700.18
1.8	0.42	0.22	525.14
2.0	0.32	0.24	400.11
2.2	0.24	0.26	300.08
2.4	0.18	0.29	225.06
2.6	0.13	0.31	162.54
2.8	0.098	0.34	122.53
3.0	0.075	0.36	93.77
3.5	0.036	0.42	45.01
4.0	0.018	0.48	22.51
4.5	0.009	0.54	11.25
5.0	0.004	0.60	5.00

203

WYACONDA CITY LAKE DAM

1. Determine drainage area of the basin

   D.A. = 200 Acres = 0.31 Sq. mi

2. Determine PMP Index Rainfall :

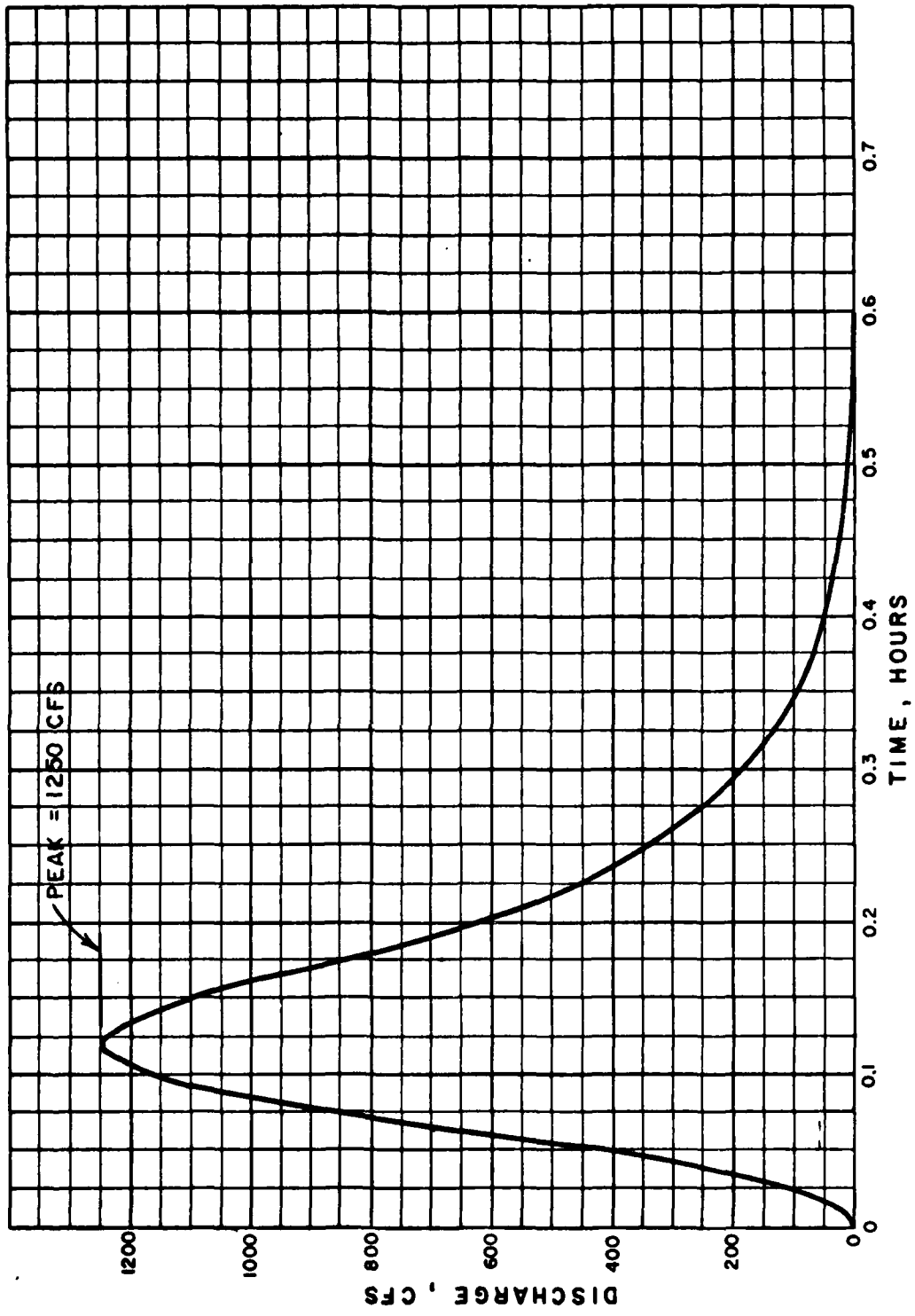
   Location : 91°54.5' - 40°,24'

   ⇒ PMP for 200 Sq. Mi & 24 hrs duration = 23.94" (from Fig 1, HMR №33)

3. Determine basin rainfall in terms of percentage of PMP Index Rainfall :

   Location : 91°54.5' - 40°24' ⇒ Zone 7

Duration (hrs.)	Percent of PMP Index Rainfall for basin area of 0.31 Sq. mi. (from Fig. 2, HMR33) %
6	100
12	120
24	130



WYACONDA CITY DAM
5 MINUTE UNIT HYDROGRAPH

DAM SAFETY INSPECTION/ MISSOURI — SHEET NO. 1 OF
WYACONDA CITY DAM — JOB NO. 1223-001
100-YEAR FLOOD BY REGRESSION EQUATION — BY MAS DATE 10-20-78

WYACONDA CITY LAKE DAM

100-YEAR FLOOD BY REGRESSION EQUATION

Regression equation for 100-year flood for Missouri:

$$Q_{100} = 85.1 A^{0.934} A^{-0.02} S^{0.576}$$

where A = drainage area in Sq. mi.

S = main channel slope ft/mi.

(Avg. slope between 0.1L and 0.85L)

For Wyaconda City Lake Dam:

A = 200 acres = 0.31 Sq. mi.

S = 41 ft / 0.54 mi = 75.93 ft/mi.

$$Q_{100} = 85.1 (0.31)^{0.934} (0.31)^{-0.02} (75.93)^{0.576}$$

$$= \underline{\underline{336 \text{ cfs}}}$$

HEC1DB INPUT DATA

```
**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  3 AUG 78
**********************************
    1              A                    DAM SAFETY INSPECTION - MISSOURI
    2              A                      WYACONDA CITY      DAM
    3              A              PMF AND 50 PERCENT PMF DETERMINATION AND ROUTING
    4              B   300       0       5       0       0       0       0       0       0       0
    5              B1    5
    6              J     1       2       1
    7              I1  1.0     0.5
    8              K     0       6                                       1
    9              K1       INPUT PMP INDEX RAINFALL AND RATIOS, INPUT SCS UNIT HYDROGRAPH
   10              M     1      -1     0.31              0.51     1.0
   11              P           23.9     100      120      130
   12              T                                                 0.85    0.07
   13              U    10
   14              U1    0     200.    1250.     615.     210.      80.      30.      7.      3.      0.
   15              X           0       1
   16              K     1       6                       2               1
   17              K1       ROUTE FLOOD HYDROGRAPH THROUGH THROUGH WYACONDA CITY LAKE DAM
   18              Y                                    1       1
   19              Y1    1                                                -687.29    -1
   20              Y687.29  688.29  689.29  690.29  691.29  692.0   693.0   694.0   695.0   696.0
   21              Y4 698.0  700.0
   22              Y5    0.    134.    373.    686.   1056.   2135.   4694.   8065.  12070.  16616.
   23              Y527111.  39234.
   24              S8    0.      4.     10.     18.     32.     61.    123.    256.2
   25              SE  665.    670.    675.    680.    685.    690.    695.    700.
   26              $$687.29
   27              $D691.29
   28              K     99
```

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	6
ROUTE HYDROGRAPH TO	6
END OF NETWORK	

INFLOW PMF AND ONE-HALF PMF HYDROGRAPHS

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1976
LAST MODIFICATION 3 AUG 78
****

RUN DATE= 78/10/24.
TIME= 14.04.35.

DAM SAFETY INSPECTION - MISSOURI
WYACONDA CITY DAM
PMF AND 50 PERCENT PMF DETERMINATION AND ROUTING

JOB SPECIFICATION

NO	NMR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	5	0	0	0	0	0	0	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 2 LRTIO= 1

RTIOS= 1.00 .50

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INPUT PMP INDEX RAINFALL AND RATIOS, INPUT SCS UNIT HY

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
6	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	-1	.31	0.00	.31	1.00	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	23.90	100.00	120.00	130.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	.85	.07	0.00	0.00

GIVEN UNIT GRAPH, NUMGO= 10
0. 200. 1250. 615. 210. 80. 30. 7. 3. 0.
UNIT GRAPH TOTALS 2395. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA
STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

MO,DA	HR,MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO,DA	HR,MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.05	1	.01	0.00	.01	0.	1.01	12.35	151	.20	.19	.01	462.
1.01	.10	2	.01	0.00	.01	0.	1.01	12.40	152	.20	.19	.01	463.

1.01	.19	3	.01	0.00	.01	0.	1.01	12.45	153	.20	.19	.01	463.
1.01	.20	4	.01	0.00	.01	0.	1.01	12.50	154	.20	.19	.01	463.
1.01	.25	5	.01	0.00	.01	0.	1.01	12.55	155	.20	.19	.01	463.
1.01	.30	6	.01	0.00	.01	0.	1.01	13.00	156	.20	.19	.01	463.
1.01	.35	7	.01	0.00	.01	0.	1.01	13.05	157	.24	.23	.01	463.
1.01	.40	8	.01	0.00	.01	0.	1.01	13.10	158	.24	.23	.01	471.
1.01	.45	9	.01	0.00	.01	0.	1.01	13.15	159	.24	.23	.01	521.
1.01	.50	10	.01	0.00	.01	0.	1.01	13.20	160	.24	.23	.01	545.
1.01	.55	11	.01	0.00	.01	0.	1.01	13.25	161	.24	.23	.01	554.
1.01	1.00	12	.01	0.00	.01	0.	1.01	13.30	162	.24	.23	.01	557.
1.01	1.05	13	.01	0.00	.01	0.	1.01	13.35	163	.24	.23	.01	558.
1.01	1.10	14	.01	0.00	.01	0.	1.01	13.40	164	.24	.23	.01	558.
1.01	1.15	15	.01	0.00	.01	0.	1.01	13.45	165	.24	.23	.01	558.
1.01	1.20	16	.01	0.00	.01	0.	1.01	13.50	166	.24	.23	.01	558.
1.01	1.25	17	.01	0.00	.01	0.	1.01	13.55	167	.24	.23	.01	558.
1.01	1.30	18	.01	0.00	.01	0.	1.01	14.00	168	.24	.23	.01	558.
1.01	1.35	19	.01	0.00	.01	0.	1.01	14.05	169	.30	.29	.01	558.
1.01	1.40	20	.01	0.00	.01	0.	1.01	14.10	170	.30	.29	.01	570.
1.01	1.45	21	.01	0.00	.01	0.	1.01	14.15	171	.30	.29	.01	645.
1.01	1.50	22	.01	0.00	.01	0.	1.01	14.20	172	.30	.29	.01	682.
1.01	1.55	23	.01	0.00	.01	0.	1.01	14.25	173	.30	.29	.01	694.
1.01	2.00	24	.01	0.00	.01	0.	1.01	14.30	174	.30	.29	.01	699.
1.01	2.05	25	.01	0.00	.01	0.	1.01	14.35	175	.30	.29	.01	701.
1.01	2.10	26	.01	0.00	.01	0.	1.01	14.40	176	.30	.29	.01	701.
1.01	2.15	27	.01	0.00	.01	0.	1.01	14.45	177	.30	.29	.01	702.
1.01	2.20	28	.01	0.00	.01	0.	1.01	14.50	178	.30	.29	.01	702.
1.01	2.25	29	.01	0.00	.01	0.	1.01	14.55	179	.30	.29	.01	702.
1.01	2.30	30	.01	0.00	.01	0.	1.01	15.00	180	.30	.29	.01	702.
1.01	2.35	31	.01	0.00	.01	0.	1.01	15.05	181	.18	.18	.01	702.
1.01	2.40	32	.01	0.00	.01	0.	1.01	15.10	182	.36	.36	.01	678.
1.01	2.45	33	.01	0.00	.01	0.	1.01	15.15	183	.36	.36	.01	568.
1.01	2.50	34	.01	0.00	.01	0.	1.01	15.20	184	.54	.54	.01	723.
1.01	2.55	35	.01	0.00	.01	0.	1.01	15.25	185	.64	.63	.01	847.
1.01	3.00	36	.01	0.00	.01	0.	1.01	15.30	186	1.54	1.54	.01	1121.
1.01	3.05	37	.01	0.00	.01	0.	1.01	15.35	187	2.54	2.54	.01	1538.
1.01	3.10	38	.01	0.00	.01	0.	1.01	15.40	188	1.00	.99	.01	29781.
1.01	3.15	39	.01	0.00	.01	0.	1.01	15.45	189	.64	.63	.01	4505.
1.01	3.20	40	.01	0.00	.01	0.	1.01	15.50	190	.54	.54	.01	3321.
1.01	3.25	41	.01	0.00	.01	0.	1.01	15.55	191	.36	.36	.01	2186.
1.01	3.30	42	.01	0.00	.01	0.	1.01	16.00	192	.36	.36	.01	1596.
1.01	3.35	43	.01	0.00	.01	0.	1.01	16.05	193	.28	.27	.01	1150.
1.01	3.40	44	.01	0.00	.01	0.	1.01	16.10	194	.28	.27	.01	937.
1.01	3.45	45	.01	0.00	.01	0.	1.01	16.15	195	.28	.27	.01	787.
1.01	3.50	46	.01	0.00	.01	0.	1.01	16.20	196	.28	.27	.01	691.
1.01	3.55	47	.01	0.00	.01	0.	1.01	16.25	197	.28	.27	.01	666.
1.01	4.00	48	.01	0.00	.01	0.	1.01	16.30	198	.28	.27	.01	658.
1.01	4.05	49	.01	0.00	.01	0.	1.01	16.35	199	.28	.27	.01	655.
1.01	4.10	50	.01	0.00	.01	0.	1.01	16.40	200	.28	.27	.01	654.
1.01	4.15	51	.01	0.00	.01	0.	1.01	16.45	201	.28	.27	.01	654.
1.01	4.20	52	.01	0.00	.01	0.	1.01	16.50	202	.28	.27	.01	654.
1.01	4.25	53	.01	0.00	.01	0.	1.01	16.55	203	.28	.27	.01	654.
1.01	4.30	54	.01	0.00	.01	0.	1.01	17.00	204	.28	.27	.01	654.
1.01	4.35	55	.01	0.00	.01	0.	1.01	17.05	205	.22	.21	.01	654.
1.01	4.40	56	.01	0.00	.01	0.	1.01	17.10	206	.22	.21	.01	6421
1.01	4.45	57	.01	0.00	.01	0.	1.01	17.15	207	.22	.21	.01	567.
1.01	4.50	58	.01	0.00	.01	0.	1.01	17.20	208	.22	.21	.01	530.
1.01	4.55	59	.01	0.00	.01	0.	1.01	17.25	209	.22	.21	.01	518.
1.01	5.00	60	.01	0.00	.01	0.	1.01	17.30	210	.22	.21	.01	513.
1.01	5.05	61	.01	0.00	.01	0.	1.01	17.35	211	.22	.21	.01	511.
1.01	5.10	62	.01	0.00	.01	0.	1.01	17.40	212	.22	.21	.01	511.

1.01	5.15	63	.01	0.00	.01	0.	1.01	17.45	213	.22	.21	.01	511.
1.01	5.20	64	.01	0.00	.01	0.	1.01	17.50	214	.22	.21	.01	511.
1.01	5.25	65	.01	.01	.01	0.	1.01	17.55	215	.22	.21	.01	511.
1.01	5.30	66	.01	.01	.01	1.	1.01	18.00	216	.22	.21	.01	511.
1.01	5.35	67	.01	.01	.01	11.	1.01	18.05	217	.02	.01	.01	511.
1.01	5.40	68	.01	.01	.01	15.	1.01	18.10	218	.02	.01	.01	471.
1.01	5.45	69	.01	.01	.01	17.	1.01	18.15	219	.02	.01	.01	222.
1.01	5.50	70	.01	.01	.01	18.	1.01	18.20	220	.02	.01	.01	99.
1.01	5.55	71	.01	.01	.01	18.	1.01	18.25	221	.02	.01	.01	58.
1.01	6.00	72	.01	.01	.01	18.	1.01	18.30	222	.02	.01	.01	42.
1.01	6.05	73	.07	.06	.01	18.	1.01	18.35	223	.02	.01	.01	36.
1.01	6.10	74	.07	.06	.01	28.	1.01	18.40	224	.02	.01	.01	34.
1.01	6.15	75	.07	.06	.01	95.	1.01	18.45	225	.02	.01	.01	34.
1.01	6.20	76	.07	.06	.01	128.	1.01	18.50	226	.02	.01	.01	34.
1.01	6.25	77	.07	.06	.01	139.	1.01	18.55	227	.02	.01	.01	34.
1.01	6.30	78	.07	.06	.01	143.	1.01	19.00	228	.02	.01	.01	34.
1.01	6.35	79	.07	.06	.01	144.	1.01	19.05	229	.02	.01	.01	34.
1.01	6.40	80	.07	.06	.01	145.	1.01	19.10	230	.02	.01	.01	34.
1.01	6.45	81	.07	.06	.01	145.	1.01	19.15	231	.02	.01	.01	34.
1.01	6.50	82	.07	.06	.01	145.	1.01	19.20	232	.02	.01	.01	34.
1.01	6.55	83	.07	.06	.01	145.	1.01	19.25	233	.02	.01	.01	34.
1.01	7.00	84	.07	.06	.01	145.	1.01	19.30	234	.02	.01	.01	34.
1.01	7.05	85	.07	.06	.01	145.	1.01	19.35	235	.02	.01	.01	34.
1.01	7.10	86	.07	.06	.01	145.	1.01	19.40	236	.02	.01	.01	34.
1.01	7.15	87	.07	.06	.01	145.	1.01	19.45	237	.02	.01	.01	34.
1.01	7.20	88	.07	.06	.01	145.	1.01	19.50	238	.02	.01	.01	34.
1.01	7.25	89	.07	.06	.01	145.	1.01	19.55	239	.02	.01	.01	34.
1.01	7.30	90	.07	.06	.01	145.	1.01	20.00	240	.02	.01	.01	34.
1.01	7.35	91	.07	.06	.01	145.	1.01	20.05	241	.02	.01	.01	34.
1.01	7.40	92	.07	.06	.01	145.	1.01	20.10	242	.02	.01	.01	34.
1.01	7.45	93	.07	.06	.01	145.	1.01	20.15	243	.02	.01	.01	34.
1.01	7.50	94	.07	.06	.01	145.	1.01	20.20	244	.02	.01	.01	34.
1.01	7.55	95	.07	.06	.01	145.	1.01	20.25	245	.02	.01	.01	34.
1.01	8.00	96	.07	.06	.01	145.	1.01	20.30	246	.02	.01	.01	34.
1.01	8.05	97	.07	.06	.01	145.	1.01	20.35	247	.02	.01	.01	34.
1.01	8.10	98	.07	.06	.01	145.	1.01	20.40	248	.02	.01	.01	34.
1.01	8.15	99	.07	.06	.01	145.	1.01	20.45	249	.02	.01	.01	34.
1.01	8.20	100	.07	.06	.01	145.	1.01	20.50	250	.02	.01	.01	34.
1.01	8.25	101	.07	.06	.01	145.	1.01	20.55	251	.02	.01	.01	34.
1.01	8.30	102	.07	.06	.01	145.	1.01	21.00	252	.02	.01	.01	34.
1.01	8.35	103	.07	.06	.01	145.	1.01	21.05	253	.02	.01	.01	34.
1.01	8.40	104	.07	.06	.01	145.	1.01	21.10	254	.02	.01	.01	34.
1.01	8.45	105	.07	.06	.01	145.	1.01	21.15	255	.02	.01	.01	34.
1.01	8.50	106	.07	.06	.01	145.	1.01	21.20	256	.02	.01	.01	34.
1.01	8.55	107	.07	.06	.01	145.	1.01	21.25	257	.02	.01	.01	34.
1.01	9.00	108	.07	.06	.01	145.	1.01	21.30	258	.02	.01	.01	34.
1.01	9.05	109	.07	.06	.01	145.	1.01	21.35	259	.02	.01	.01	34.
1.01	9.10	110	.07	.06	.01	145.	1.01	21.40	260	.02	.01	.01	34.
1.01	9.15	111	.07	.06	.01	145.	1.01	21.45	261	.02	.01	.01	34.
1.01	9.20	112	.07	.06	.01	145.	1.01	21.50	262	.02	.01	.01	34.
1.01	9.25	113	.07	.06	.01	145.	1.01	21.55	263	.02	.01	.01	34.
1.01	9.30	114	.07	.06	.01	145.	1.01	22.00	264	.02	.01	.01	34.
1.01	9.35	115	.07	.06	.01	145.	1.01	22.05	265	.02	.01	.01	34.
1.01	9.40	116	.07	.06	.01	145.	1.01	22.10	266	.02	.01	.01	34.
1.01	9.45	117	.07	.06	.01	145.	1.01	22.15	267	.02	.01	.01	34.
1.01	9.50	118	.07	.06	.01	145.	1.01	22.20	268	.02	.01	.01	34.
1.01	9.55	119	.07	.06	.01	145.	1.01	22.25	269	.02	.01	.01	34.
1.01	10.00	120	.07	.06	.01	145.	1.01	22.30	270	.02	.01	.01	34.
1.01	10.05	121	.07	.06	.01	145.	1.01	22.35	271	.02	.01	.01	34.
1.01	10.10	122	.07	.06	.01	145.	1.01	22.40	272	.02	.01	.01	34.

1.01	10.15	123	.07	.06	.01	145.	1.01	22.45	273	.02	.01	.01	34.
1.01	10.20	124	.07	.06	.01	145.	1.01	22.50	274	.02	.01	.01	34.
1.01	10.25	125	.07	.06	.01	145.	1.01	22.55	275	.02	.01	.01	34.
1.01	10.30	126	.07	.06	.01	145.	1.01	23.00	276	.02	.01	.01	34.
1.01	10.35	127	.07	.06	.01	145.	1.01	23.05	277	.02	.01	.01	34.
1.01	10.40	128	.07	.06	.01	145.	1.01	23.10	278	.02	.01	.01	34.
1.01	10.45	129	.07	.06	.01	145.	1.01	23.15	279	.02	.01	.01	34.
1.01	10.50	130	.07	.06	.01	145.	1.01	23.20	280	.02	.01	.01	34.
1.01	10.55	131	.07	.06	.01	145.	1.01	23.25	281	.02	.01	.01	34.
1.01	11.00	132	.07	.06	.01	145.	1.01	23.30	282	.02	.01	.01	34.
1.01	11.05	133	.07	.06	.01	145.	1.01	23.35	283	.02	.01	.01	34.
1.01	11.10	134	.07	.06	.01	145.	1.01	23.40	284	.02	.01	.01	34.
1.01	11.15	135	.07	.06	.01	145.	1.01	23.45	285	.02	.01	.01	34.
1.01	11.20	136	.07	.06	.01	145.	1.01	23.50	286	.02	.01	.01	34.
1.01	11.25	137	.07	.06	.01	145.	1.01	23.55	287	.02	.01	.01	34.
1.01	11.30	138	.07	.06	.01	145.	1.02	0.00	288	.02	.01	.01	34.
1.01	11.35	139	.07	.06	.01	145.	1.02	.05	289	0.00	0.00	0.00	34.
1.01	11.40	140	.07	.06	.01	145.	1.02	.10	290	.00	0.00	0.00	31.
1.01	11.45	141	.07	.06	.01	145.	1.02	.15	291	.00	0.00	0.00	13.
1.01	11.50	142	.07	.06	.01	145.	1.02	.20	292	0.00	0.00	0.00	5.
1.01	11.55	143	.07	.06	.01	145.	1.02	.25	293	0.00	0.00	0.00	2.
1.01	12.00	144	.07	.06	.01	145.	1.02	.30	294	0.00	0.00	0.00	1.
1.01	12.05	145	.20	.19	.01	145.	1.02	.35	295	0.00	0.00	0.00	0.
1.01	12.10	146	.20	.19	.01	172.	1.02	.40	296	0.00	0.00	0.00	0.
1.01	12.15	147	.20	.19	.01	338.	1.02	.45	297	0.00	0.00	0.00	0.
1.01	12.20	148	.20	.19	.01	419.	1.02	.50	298	0.00	0.00	0.00	0.
1.01	12.25	149	.20	.19	.01	447.	1.02	.55	299	0.00	0.00	0.00	0.
1.01	12.30	150	.20	.19	.01	458.	1.02	1.00	300	0.00	0.00	0.00	0.
									SUM	31.07	28.91	2.16	69267.
										(789.)	(734.)	(55.)	(1961.48)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4505.	777.	240.	231.	69248.
CMS	128.	22.	7.	7.	1961.
INCHES		23.31	28.86	28.86	28.86
MM		591.97	733.05	733.05	733.05
AC-FT		385.	477.	477.	477.
THOUS CU M		475.	588.	588.	588.

HYDROGRAPH AT STA 6 FOR PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	1.	11.	15.	17.	18.
18.	18.	18.	28.	95.	128.	139.	143.	144.	145.	145.
145.	145.	145.	145.	145.	145.	145.	145.	145.	145.	145.
145.	145.	145.	145.	145.	145.	145.	145.	145.	145.	145.
145.	145.	145.	145.	145.	145.	145.	145.	145.	145.	145.
145.	145.	145.	145.	145.	145.	145.	145.	145.	145.	145.
145.	145.	145.	145.	145.	145.	145.	145.	145.	145.	145.
145.	145.	145.	145.	145.	145.	145.	145.	145.	145.	145.
145.	145.	145.	145.	145.	172.	338.	419.	447.	458.	
462.	463.	463.	463.	463.	463.	463.	471.	521.	545.	
594.	557.	558.	558.	558.	558.	558.	558.	558.	570.	

645.	682.	694.	699.	701.	701.	702.	702.	702.	702.
702.	678.	568.	723.	847.	1121.	1538.	2972.	4505.	3321.
2186.	1596.	1150.	937.	767.	691.	666.	658.	655.	654.
654.	654.	654.	654.	654.	642.	567.	530.	518.	513.
511.	511.	511.	511.	511.	511.	511.	471.	222.	99.
58.	42.	36.	34.	34.	34.	34.	34.	34.	34.
34.	34.	34.	34.	34.	34.	34.	34.	34.	34.
34.	34.	34.	34.	34.	34.	34.	34.	34.	34.
34.	34.	34.	34.	34.	34.	34.	34.	34.	34.
34.	34.	34.	34.	34.	34.	34.	34.	34.	34.
34.	34.	34.	34.	34.	34.	34.	34.	34.	34.
34.	34.	34.	34.	34.	34.	34.	34.	34.	31.
13.	5.	2.	1.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4505.	777.	240.	231.	69248.
CMS	128.	22.	7.	7.	1961.
INCHES		23.31	28.86	28.86	28.86
MM		591.97	733.05	733.05	733.05
AC-FT		385.	477.	477.	477.
THOUS CU M		475.	588.	588.	588.

HYDROGRAPH AT STA 6 FOR PLAN 1, RTIO 2

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	1.	5.	8.	8.	9.
9.	9.	9.	14.	47.	64.	69.	71.	72.	72.
73.	73.	73.	73.	73.	73.	73.	73.	73.	73.
73.	73.	73.	73.	73.	73.	73.	73.	73.	73.
73.	73.	73.	73.	73.	73.	73.	73.	73.	73.
73.	73.	73.	73.	73.	73.	73.	73.	73.	73.
73.	73.	73.	73.	73.	73.	73.	73.	73.	73.
73.	73.	73.	73.	73.	73.	73.	73.	73.	73.
73.	73.	73.	73.	73.	86.	169.	210.	224.	229.
231.	231.	232.	232.	232.	232.	232.	236.	260.	273.
277.	278.	279.	279.	279.	279.	279.	279.	279.	285.
323.	341.	347.	350.	350.	351.	351.	351.	351.	351.
351.	339.	284.	362.	423.	560.	769.	1486.	2253.	1660.
1093.	798.	575.	469.	384.	345.	333.	329.	327.	327.
327.	327.	327.	327.	327.	321.	284.	265.	259.	257.
256.	255.	255.	255.	255.	255.	255.	235.	111.	50.
29.	21.	18.	17.	17.	17.	17.	17.	17.	17.
17.	17.	17.	17.	17.	17.	17.	17.	17.	17.
17.	17.	17.	17.	17.	17.	17.	17.	17.	17.
17.	17.	17.	17.	17.	17.	17.	17.	17.	17.
17.	17.	17.	17.	17.	17.	17.	17.	17.	17.
17.	17.	17.	17.	17.	17.	17.	17.	17.	17.
17.	17.	17.	17.	17.	17.	17.	17.	17.	15.
9.	2.	1.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2253.	388.	120.	115.	34624.
CMS	64.	11.	3.	3.	980.
INCHES		11.65	14.43	14.43	14.43

PMF FLOOD ROUTING

	MM	295.98	366.53	366.53	366.53
	AC-FT	193.	238.	238.	238.
	THOUS CU M	238.	294.	294.	294.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE FLOOD HYDROGRAPH THROUGH THROUGH NYACONDA CITY L

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
6	1	0	0	2	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-687.	-1

STAGE	687.3	688.3	689.3	690.3	691.3	692.0	693.0	694.0	695.0	696.0
	698.0	700.0								
FLOW	0.	134.	373.	686.	1056.	2135.	4694.	8065.	12070.	18616.
	27111.	39234.								
CAPACITY=	0.	4.	10.	18.	32.	61.	123.	256.		
ELEVATION=	665.	670.	675.	680.	685.	690.	695.	700.		

CREL	SPWID	COOW	EXPW	FLEVL	COOL	CAREA	EXPL
687.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
691.3	0.0	0.0	0.

STATION 6, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	1.	3.	5.	9.
8.	10.	11.	13.	20.	33.	48.	62.	78.	88.
93.	101.	107.	113.	118.	122.	125.	128.	130.	133.
135.	137.	139.	14 .	142.	143.	143.	144.	144.	144.
144.	145.	145.	145.	145.	145.	145.	145.	145.	145.
145.	145.	145.	145.	145.	145.	145.	145.	145.	145.
145.	145.	145.	145.	145.	145.	145.	145.	145.	145.
145.	145.	145.	145.	145.	145.	145.	145.	145.	145.
145.	145.	145.	145.	145.	148.	175.	225.	277.	321.
355.	384.	409.	426.	437.	445.	450.	455.	468.	488.

507.	522.	533.	541.	545.	549.	551.	553.	554.	557.
573.	598.	613.	626.	638.	648.	657.	664.	670.	675.
679.	681.	672.	667.	686.	742.	851.	1237.	2956.	3751.
2922.	2085.	1663.	1295.	1049.	989.	931.	881.	839.	805.
777.	754.	735.	720.	708.	697.	680.	659.	638.	618.
601.	579.	557.	543.	533.	526.	522.	512.	460.	368.
296.	235.	186.	148.	126.	112.	101.	91.	82.	75.
69.	64.	59.	56.	52.	50.	47.	45.	44.	42.
41.	40.	39.	38.	38.	37.	36.	36.	36.	35.
35.	35.	35.	35.	35.	34.	34.	34.	34.	34.
34.	34.	34.	34.	34.	34.	34.	34.	34.	34.
34.	34.	34.	34.	34.	34.	34.	34.	34.	34.
34.	34.	34.	34.	34.	34.	34.	34.	34.	34.
32.	28.	25.	21.	18.	16.	13.	11.	10.	8.

STORAGE

45.	45.	45.	45.	45.	45.	45.	45.	45.	45.
45.	45.	45.	45.	45.	45.	45.	45.	45.	45.
45.	45.	45.	45.	45.	45.	45.	45.	45.	45.
45.	45.	45.	45.	45.	45.	45.	45.	45.	45.
45.	45.	45.	45.	45.	45.	45.	45.	45.	45.
45.	45.	45.	45.	45.	45.	45.	45.	45.	45.
45.	45.	45.	45.	45.	45.	45.	45.	45.	46.
46.	46.	46.	46.	46.	47.	47.	48.	48.	49.
49.	50.	50.	50.	50.	51.	51.	51.	51.	51.
51.	51.	51.	51.	51.	51.	51.	51.	51.	51.
51.	51.	51.	51.	51.	51.	51.	51.	51.	51.
51.	51.	51.	51.	51.	51.	51.	51.	51.	51.
51.	51.	51.	51.	51.	51.	51.	51.	51.	51.
51.	51.	51.	51.	51.	51.	51.	51.	51.	51.
51.	51.	51.	51.	51.	51.	52.	53.	55.	56.
56.	57.	58.	58.	58.	58.	58.	58.	59.	59.
59.	60.	60.	60.	60.	60.	60.	60.	60.	60.
61.	61.	62.	62.	63.	63.	63.	64.	64.	64.
64.	64.	64.	64.	65.	66.	70.	78.	90.	94.
90.	85.	82.	79.	77.	75.	73.	71.	70.	69.
68.	67.	66.	66.	65.	65.	64.	64.	63.	62.
61.	61.	60.	60.	60.	60.	60.	59.	58.	57.
55.	54.	52.	51.	51.	50.	50.	49.	49.	49.
48.	48.	48.	48.	48.	47.	47.	47.	47.	47.
47.	47.	47.	47.	47.	47.	47.	47.	47.	47.
47.	47.	47.	47.	47.	47.	47.	47.	47.	47.
47.	47.	47.	47.	47.	47.	47.	47.	47.	47.
47.	47.	47.	47.	47.	47.	47.	47.	47.	47.
47.	47.	47.	47.	47.	47.	47.	47.	47.	47.
47.	47.	46.	46.	46.	46.	46.	46.	46.	46.

STAGE

687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3
687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3
687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3
687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3
687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3
687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3
687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3
687.4	687.4	687.4	687.4	687.4	687.5	687.6	687.8	687.8	687.9
688.0	688.0	688.1	688.1	688.2	688.2	688.2	688.2	688.3	688.3
688.3	688.3	688.3	688.3	688.3	688.3	688.3	688.3	688.3	688.3
688.3	688.3	688.3	688.3	688.3	688.3	688.3	688.3	688.3	688.3
688.3	688.3	688.3	688.3	688.3	688.3	688.3	688.3	688.3	688.3

688.3	688.3	688.3	688.3	688.3	688.3	688.3	688.3	688.3	688.3
688.3	688.3	688.3	688.3	688.3	688.3	688.3	688.3	688.3	688.3
688.3	688.3	688.3	688.3	688.3	688.3	688.5	688.7	688.9	689.1
689.2	689.3	689.4	689.5	689.5	689.5	689.5	689.6	689.6	689.7
689.7	689.8	689.8	689.8	689.8	689.9	689.9	689.9	689.9	689.9
689.9	690.0	690.1	690.1	690.1	690.2	690.2	690.2	690.2	690.3
690.3	690.3	690.2	690.2	690.3	690.4	690.7	691.4	692.3	692.6
692.3	692.0	691.7	691.4	691.3	691.1	691.0	690.8	690.7	690.6
690.5	690.5	690.4	690.4	690.3	690.3	690.3	690.2	690.1	690.1
690.0	689.9	689.9	689.8	689.8	689.8	689.8	689.7	689.6	689.3
689.0	688.7	688.5	688.4	688.2	688.1	688.0	688.0	687.9	687.9
687.8	687.8	687.7	687.7	687.7	687.7	687.6	687.6	687.6	687.6
687.6	687.6	687.6	687.6	687.6	687.6	687.6	687.6	687.6	687.6
687.6	687.6	687.5	687.5	687.5	687.5	687.5	687.5	687.5	687.5
687.5	687.5	687.5	687.5	687.5	687.5	687.5	687.5	687.5	687.5
687.5	687.5	687.5	687.5	687.5	687.5	687.5	687.5	687.5	687.5
687.5	687.5	687.5	687.5	687.5	687.5	687.5	687.5	687.5	687.5
687.5	687.5	687.5	687.4	687.4	687.4	687.4	687.4	687.4	687.4

PEAK OUTFLOW IS 3751. AT TIME 15.83 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3751.	768.	240.	231.	69183.
CMS	106.	22.	7.	7.	1959.
INCHES		23.03	28.83	28.83	28.83
MM		585.06	732.37	732.37	732.37
AC-FT		381.	476.	476.	476.
THOUS CU M		470.	588.	588.	588.

MAXIMUM STORAGE = 94.

ONE-HALF PMF FLOOD ROUTING

OVN

STATION 6, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	1.	2.	3.
4.	5.	5.	6.	10.	17.	24.	31.	37.	42.
47.	50.	54.	56.	59.	61.	63.	64.	65.	66.
67.	68.	69.	69.	70.	70.	70.	71.	71.	71.
71.	72.	72.	72.	72.	72.	72.	72.	72.	72.
72.	72.	72.	72.	72.	72.	72.	72.	72.	72.
72.	72.	72.	72.	72.	72.	72.	73.	73.	73.
73.	73.	73.	73.	73.	73.	73.	73.	73.	73.
73.	73.	73.	73.	73.	73.	81.	97.	115.	131.
154.	173.	188.	198.	207.	213.	218.	221.	228.	238.
247.	254.	261.	265.	269.	271.	273.	275.	276.	277.
284.	296.	308.	318.	326.	332.	336.	340.	343.	345.
346.	346.	337.	334.	348.	387.	474.	658.	859.	1081.
1256.	1072.	989.	902.	813.	730.	661.	608.	533.	469.
424.	394.	373.	361.	353.	346.	335.	320.	306.	294.
284.	277.	272.	268.	265.	262.	261.	257.	236.	197.
158.	129.	113.	99.	87.	76.	68.	60.	54.	48.
44.	40.	36.	33.	31.	29.	27.	26.	24.	23.
22.	22.	21.	20.	20.	19.	19.	19.	18.	18.
18.	18.	18.	18.	17.	17.	17.	17.	17.	17.
17.	17.	17.	17.	17.	17.	17.	17.	17.	17.
17.	17.	17.	17.	17.	17.	17.	17.	17.	17.
17.	17.	17.	17.	17.	17.	17.	17.	17.	17.
16.	14.	12.	11.	9.	8.	7.	6.	5.	4.

STORAGE

45.	45.	45.	45.	45.	45.	45.	45.	45.	45.
45.	45.	45.	45.	45.	45.	45.	45.	45.	45.
45.	45.	45.	45.	45.	45.	45.	45.	45.	45.
45.	45.	45.	45.	45.	45.	45.	45.	45.	45.
45.	45.	45.	45.	45.	45.	45.	45.	45.	45.
45.	45.	45.	45.	45.	45.	45.	45.	45.	45.
45.	45.	45.	45.	45.	45.	45.	45.	45.	45.
45.	45.	46.	46.	46.	46.	46.	47.	47.	47.
47.	47.	48.	48.	48.	48.	48.	48.	48.	48.
48.	48.	48.	48.	48.	48.	48.	48.	48.	48.
48.	48.	48.	48.	48.	48.	48.	48.	48.	48.
48.	48.	48.	48.	48.	48.	48.	48.	48.	48.
48.	48.	48.	48.	48.	48.	48.	48.	48.	48.
48.	48.	48.	48.	48.	48.	48.	48.	48.	48.
48.	48.	48.	48.	48.	48.	48.	48.	48.	48.
48.	48.	48.	48.	48.	48.	49.	49.	50.	51.
52.	52.	52.	53.	53.	53.	53.	53.	53.	54.
54.	54.	54.	54.	54.	54.	54.	54.	55.	55.
55.	55.	55.	56.	56.	56.	56.	56.	56.	56.
56.	56.	56.	56.	56.	57.	59.	63.	70.	77.
79.	77.	75.	72.	69.	66.	64.	62.	60.	59.
58.	57.	57.	57.	56.	56.	56.	56.	55.	55.

55.	55.	54.	54.	54.	54.	54.	54.	54.	53.
52.	51.	50.	50.	49.	49.	48.	48.	48.	47.
47.	47.	47.	47.	47.	47.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	46.	46.	45.	45.

STAGE

687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3
687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3
687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3
687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3
687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3
687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3
687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3	687.3
687.3	687.3	687.3	687.3	687.4	687.4	687.5	687.5	687.6	687.6
687.6	687.7	687.7	687.7	687.7	687.7	687.8	687.8	687.8	687.8
687.8	687.8	687.8	687.8	687.8	687.8	687.8	687.8	687.8	687.8
687.8	687.8	687.8	687.8	687.8	687.8	687.8	687.8	687.8	687.8
687.8	687.8	687.8	687.8	687.8	687.8	687.8	687.8	687.8	687.8
687.8	687.8	687.8	687.8	687.8	687.8	687.8	687.8	687.8	687.8
687.8	687.8	687.8	687.8	687.8	687.8	687.8	687.8	687.8	687.8
687.8	687.8	687.8	687.8	687.8	687.8	687.9	688.0	688.1	688.3
688.4	688.5	688.5	688.6	688.6	688.6	688.6	688.7	688.7	688.7
688.8	688.8	688.8	688.8	688.9	688.9	688.9	688.9	688.9	688.9
688.9	689.0	689.0	689.1	689.1	689.1	689.1	689.2	689.2	689.2
689.2	689.2	689.1	689.1	689.2	689.3	689.6	690.1	690.8	691.3
691.4	691.3	691.1	690.9	690.6	690.4	690.2	690.0	689.8	689.6
689.5	689.4	689.3	689.2	689.2	689.2	689.1	689.1	689.0	689.0
688.9	688.9	688.9	688.8	688.8	688.8	688.8	688.8	688.7	688.8
688.4	688.3	688.1	688.0	687.9	687.9	687.8	687.7	687.7	687.7
687.6	687.6	687.6	687.5	687.5	687.5	687.5	687.5	687.5	687.5
687.5	687.5	687.4	687.4	687.4	687.4	687.4	687.4	687.4	687.4
687.4	687.4	687.4	687.4	687.4	687.4	687.4	687.4	687.4	687.4
687.4	687.4	687.4	687.4	687.4	687.4	687.4	687.4	687.4	687.4
687.4	687.4	687.4	687.4	687.4	687.4	687.4	687.4	687.4	687.4
687.4	687.4	687.4	687.4	687.4	687.4	687.4	687.4	687.4	687.4
687.4	687.4	687.4	687.4	687.4	687.3	687.3	687.3	687.3	687.3

PEAK OUTFLOW IS 1256. AT TIME 15.92 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1256.	382.	120.	115.	34599.
CMS	36.	11.	3.	3.	980.
INCHES		1[illegible].46	14.42	14.42	14.42
MM		29[illegible].00	366.26	366.26	366.26
AC-FT		189.	238.	238.	238.
THOUS CU M		234.	294.	294.	294.

MAXIMUM STORAGE = 79.

SUMMARY OF PMF AND ONE-HALF PMF FLOOD ROUTING

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS	
				RATIO 1 1.00	RATIO 2 .50
HYDROGRAPH AT	6	.31	1	4505.	2293.
		(.80)		(127.57)	(63.79)
ROUTED TO	6	.31	1	3751.	1256.
		(.80)		(106.22)	(35.58)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	687.29	687.29	691.29
STORAGE	45.	45.	77.
OUTFLOW	0.	0.	1056.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	692.63	1.34	94.	3751.	.58	15.83	0.00
.50	691.42	.13	79.	1256.	.25	15.92	0.00

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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION    JULY 1978
  LAST MODIFICATION  3 AUG 78
**********
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PERCENT OF PMF FLOOD ROUTING
EQUAL TO SPILLWAY CAPACITY

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	6
ROUTE HYDROGRAPH TO	6
END OF NETWORK	

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 3 AUG 78
****

RUN DATE= 78/10/26.
TIME= 07.46.21.

DAM SAFETY INSPECTION - MISSOURI
WYACONDA CITY DAM
PERCENT OF PMF DETERMINATION AND ROUTING

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	5	0	0	0	0	0	4	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1

RTIOS= .42 .43 .44 .45 .46 .47 .48 .49 .50

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INPUT PMP INDEX RAINFALL AND RATIOS, INPUT SCS UNIT HY

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
6	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	-1	.31	0.00	.31	1.00	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	23.90	100.00	120.00	130.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	.85	.07	0.00	0.00

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	31.07	28.91	2.16	69247.
										(789.)	(734.)	(55.)	(1961.82)

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE FLOOD HYDROGRAPH THROUGH THROUGH MYACONDA CITY L

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
6	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-687.	-1

STAGE	687.3	688.3	689.3	690.3	691.3	692.0	693.0	694.0	695.0	696.0
	698.0	700.0								
FLOW	0.	134.	373.	686.	1056.	2135.	4694.	8065.	12070.	16616.
	27111.	39234.								
CAPACITY=	0.	4.	10.	18.	32.	61.	123.	256.		
ELEVATION=	665.	670.	675.	680.	685.	690.	695.	700.		

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
687.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMMID
691.3	0.0	0.0	0.

PEAK OUTFLOW IS 960. AT TIME 15.92 HOURS

PEAK OUTFLOW IS 979. AT TIME 15.92 HOURS

PEAK OUTFLOW IS 999. AT TIME 15.92 HOURS

PEAK OUTFLOW IS 1019. AT TIME 15.92 HOURS

PEAK OUTFLOW IS 1040. AT TIME 15.92 HOURS

PEAK OUTFLOW IS 1070. AT TIME 15.92 HOURS

PEAK OUTFLOW IS 1130. AT TIME 15.92 HOURS

PEAK OUTFLOW IS 1208. AT TIME 15.92 HOURS

PEAK OUTFLOW IS 1256. AT TIME 15.92 HOURS

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS								
				RATIO 1 .42	RATIO 2 .43	RATIO 3 .44	RATIO 4 .45	RATIO 5 .46	RATIO 6 .47	RATIO 7 .48	RATIO 8 .49	RATIO 9 .50
HYDROGRAPH AT	6	.31	1	1892.	1937.	1982.	2027.	2072.	2117.	2162.	2208.	2253.
	(	.80)	(	53.58)(	54.86)(	56.13)(	57.41)(	58.68)(	59.96)(	61.23)(	62.51)(	63.79)
ROUTED TO	6	.31	1	960.	979.	999.	1019.	1040.	1070.	1136.	1202.	1256.
	(	.80)	(	27.17)(	27.73)(	28.29)(	28.86)(	29.45)(	30.31)(	32.17)(	34.02)(	35.58)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	687.29	687.29	691.29
STORAGE	45.	45.	77.
OUTFLOW	0.	0.	1056.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.42	691.03	0.00	74.	960.	0.00	15.92	0.00
.43	691.08	0.00	74.	979.	0.00	15.92	0.00
.44	691.14	0.00	75.	999.	0.00	15.92	0.00
.45	691.19	0.00	76.	1019.	0.00	15.92	0.00
.46	691.25	0.00	76.	1040.	0.00	15.92	0.00
.47	691.30	.01	77.	1070.	.08	15.92	0.00
.48	691.34	.05	78.	1136.	.08	15.92	0.00
.49	691.39	.10	78.	1202.	.08	15.92	0.00
.50	691.42	.13	79.	1256.	.25	15.92	0.00


DA
FILM